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MUHLENBERGIA

An Illustrated Monthly Journal of Botany

Editors: A. A. HELLER and P. BEVERIDGE KENNEDY

Volume 6

Reno, Nevada,
1910

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JANUARY, 1910

Editors: A. A. HELLER and P. BEVERIDGE KENNEDY

Ranunculus glaberrimus Hook. (Illustrating The First Spring Flower.)

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University of Nevada,
Reno, Nevada

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Volume 6 January 31, 1910

MUHLENBERGIA

THREE NEW ERIOGONUMS

By Edward L. Greene

Eriogonum cyclosepalum sp. nov.

Annual, allied to *E. Abertianum*, as stout and woody at base, but low, commonly no more than 5 or 6 inches high, erect-spreading, the bushy width of the mature plant nearly or quite equal to its height, floriferous throughout almost from the very base, dull-green by a thin villous pubescence, but young plants rather heavily villous-tomentulose: basal leaves on long slender petioles, the blades about ¾ inch long, nearly as broad below the middle, broadly ovate, or cordate-ovate, acute; those verticillate on the stem successively smaller, narrow, the distinction of blade and petiole obsolete in those of the upper verticils: segments of the involucres elongated greatly, several times longer than the body, equalling the flowers or surpassing them: outer sepals seemingly orbicular, the basal sinus closed, in maturity dull crimson, though in anthesis only cream-colored with a tinge of red.

A common species of open plains and table lands in New Mexico, and from an early period confused with *E. Abertianum*. The oldest specimens before me were collected in western Texas by Charles Wright as long ago as 1849; and next these, in point of time, are two sheets of Charles Wright's number 1761, gathered in New Mexico in 1851 or 1852; and all these specimens of Wright's gathering are in the U. S. Herbarium labelled in Dr. Torrey's handwriting *Eriogonum Abertianum*. The one sheet of these three which exhibits young and hoary specimens is noted in the same hand, "forma *tomentosa*," but, as I have said above, the young plants are always tomentulose, the old, or even the well matured, are never so.

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Almost thirty years ago I noted the striking differences of habit and general aspect, between this low plant and *E. Abertianum;* which latter is a tall plant, with stem simple below, paniculate above, whereas *E. cyclosepalum* is invariably low, branched from the very base, in no part paniculate, but with every branch from base to apex leafy and floriferous, and the leafage and flowering withal rather dense. The perianths are larger in the species here proposed as new; but a better mark, over and above the totally different habit, is the great length of the oblong and leaf-like segments of the involucre.

Excellent recent specimens of *E. cyclosepalum* are those of E. O. Wooton, from the mesa west of the Organ Mountains, New Mexico, May, 1905; also those of Wooton and Standley from the same station, August, 1906. From the Black Range in Sierra county, New Mexico, specimens were distributed by O. B. Metcalf, under his number 1276, in I think 1904. It was upon an examination of these that I decided to no longer defer naming what I had for so many years seen to be an undescribed member of this genus.

Eriogonum lappulaceum sp. nov.

Small annual ally of *E. Abertianum* about 6 inches high and rather strict, the few and alternate branches in no degree cymose or paniculate, ascending or suberect, the involucres racemosely or subspicately arranged: lower leaves of the undivided stem rhombic-ovate to elliptic, short petioled, softly somewhat villous but not hoary: involucres few-flowered, the oblong segments longer than the body and often equalling the flowers: outer sepals not orbicular, manifestly broader above the middle than at the base, the summit almost truncately obtuse, the basal lobes gradually rounded and obvious as such.

Species of remarkable appearance as to habit; in fruit recalling some of the western forms of the genus *Lappula*, that is, annual species like *L. occidentalis.* The only specimens are from Camp Charlotte, Texas, by Nealley, collected in 1889. One specimen of *E. Abertianum* is mounted with these on the type sheet in the U. S. Herbarium. Llano Co., Tex.

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Eriogonum pinetorum sp. nov.

Annual, related to *E. Abertianum*, quite as tall, comparatively slender, the foliage thin, not hoary: stem simple and very leafy for a few inches above the base with ovate, lance-ovate and elliptic sparingly villous short-petioled leaves; thence parted into a very large and loose cymose panicle, the nodes marked by verticils of oblong and oblong-linear sessile leaves or bracts: segments of the involucres subulate-lanceolate, little longer than the body and much shorter than the depressed-globose flower cluster: outer sepals orbicular, but with manifest linear sinus at base, smaller than in allied species, flesh-colored.

Species common enough in open pine woods of the higher mountains of New Mexico and Arizona, entirely above and beyond the range of *E. Abertianum* of the open plains below; the type specimen is O. B. Metcalf's number 1327 from the Black Range, Sierra county, New Mexico; but it is in the U. S. Herbarium from the Organ Mountains, G. R. Vasey, 1881, also from mesa west of the Organ Mountains, Wooton and Standley, 1906. I also refer here certain specimens collected by Dr. E. A. Mearns at Dog Springs, New Mexico, in 1883, others by the same from along the Mexican boundary near Whitewater, in the same year, besides one sheet from Monument no. 82.

True *E. Abertianum*, when as large as *E. pinetorum*, is still a stout coarse sparingly branched and sparingly flowering plant, with a firmer and hoary foliage, most of the younger leaves being crisped on the margins, and rather strongly so. Its involucres are different, and its outer sepals not quite orbicular.

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RECENT LITERATURE

DISTRIBUTION AND MOVEMENTS OF DESERT PLANTS. By Volney M. Spalding. Carnegie Institution, Washington, D. C. 1909. Pp. 144. Plates 1-31.

This able paper is concerned, primarily, with an investigation of the edaphic and ecological relations of the plant covering of the domain of the Desert Botanical Laboratory, an area of some four square miles near Tucson, Arizona. The tract includes Tumamoc Hill, on whose northern slope the Laboratory buildings are situated, and which rears its flattened summit 3092 feet above sea level, and 742 feet above the flood plain of the Santa Cruz river, as well as a part of that plain, and of the intervening mesa-like slopes. The hill is cut, and in a limited sense drained, by a characteristic desert wash, with its tributary gullies. The Santa Cruz is a typical "river" of the arid west; in flood a raging and eroding torrent, soon becoming a feeble stream, and for much of the time a bed of bare sand, whose only moisture is beneath the surface. The domain also shares in the dual annual vegetation which twice each year clothes the scorched plains and hills of Arizona with a brief but luxuriant growth of fundamentally different plants, responsive respectively to the winter and to the summer rains.

It will be seen therefore, that limited as is this area, it is fairly representative of the topography of the whole region, with the exception of the higher mountains. Within its bounds grow the few hydrophytes of the river pools and the irrigation ditches, the equally scanty mesophytes of the river banks, the halophytes of the alkaline "salt spots," and above all the abundant and varied xerophytic vegetation of the mesa and hill slopes.

Long and careful study has been given to these various plant associations; both over the general area, and of small tracts especially marked out for comparative observation; and the whole has been supplemented by work in other desert localities. To a description of these researches, and to an account of some of the interesting and instructive deductions drawn from them the paper is devoted. Five typical plants, as representatives of

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marked classes, are selected for minute investigation; and an important section is devoted to the dispersal, and to the topographical advance or retrocession of species. In this connection interesting remarks are included touching the agency of animals in aiding, or in restricting, the multiplication of plants. Soil conditions, as to moisture, temperature and aeration, as well as to mechanical and chemical constitution, are shown to be the determining factors in the distribution of some species, while others are mainly influenced by aspect, which is but another name for temperature and evaporation. The conclusion reached is, that "desert plants are governed by the same general laws in their relation to environmental conditions as are those of other regions," but acting under different limitations.

Besides Dr. Spalding's own work there are included in the paper contributions from several other naturalists. Dr. Bruce Fink discusses the lichens of the domain, and Dr. W. A. Cannon contributes a study of the root system of the sahuaro. The geology of the area is described by Professor Talman, and the soils by Dr. B. E. Livingston. Professor Thornber reports on the vegetative groups, and lists the plants of each distinctive subarea, dividing them with reference to form and duration. The origin of desert floras is ably treated by Dr. MacDougal. In fine, Dr. Spalding may be said to have given us the most important contribution yet made to the knowledge of the plant life of the arid west.—S. B. PARISH.

THE FIRST SPRING FLOWER

BY A. A. HELLER

(With cover illustration)

By studying the records of plant collections, one may discover much concerning the advances made in the study of botany, and the progress of knowledge in general.

Only a few years ago it was a common practice to record the name of the state where the plant was collected, and sometimes the year was added and sometimes it was not. A few examples are: "Oregon: coll. Elihu Hall, ann. 1871;" "Southern

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Utah, northern Arizona, &c., coll. Dr. E. Palmer, 1877;" "California, Douglas."

There is some excuse for the earlier imperfect data, when the country was less known than now, but there were always some towns, mountains, or rivers, near enough to approximately designate the place of collection. Among the more recent collections are labels reading "Kootenai county, Idaho," with the year and month of collection, which is quite an improvement over some of the older ones, but Kootenai county, Idaho, could swallow the whole of the state of Rhode Island and feel very empty indeed; so there is still much lacking in this record.

At the present time a fairly complete record indicates the state, the county, the precise place in the county as near as one can get at it, the year, month, day of the month, and altitude above sea level. All these things are necessary, and can be put upon a label of neat and convenient size. But even such information, complete as it may seem as compared with early records, is far from perfection. In some cases it is important to know the time of day when a given species is found in bloom. And since the study of ecology has assumed such important proportions, one must needs know the character of the soil, the exposure, the various plants which grow in company, and other things which our forefathers never considered at all.

In former days it was considered sufficient when describing a plant, if more than one specimen of a supposedly single species was at hand, to merely give the range. Now the record is not complete unless a certain definite specimen is cited as the type.

All this may seem far removed from the subject, "The first Spring Flower," but is introduced to show the value of accurate and complete records. Indeed, the weather man could acquire much valuable information by studying a carefully kept record of the plants of any given locality.

The very first plant to come into bloom in the vicinity of Reno is *Ranunculus glaberrimus* Hook. The earliest date upon which it has been found in bloom is January 5th, when it was brought in by Miss Lewers, a member of the faculty of the Uni-

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versity of Nevada. However, there was no possibility of finding it on January 5, 1910, for on that date we had a temperature of from six to ten degrees below zero, with six inches of snow on the ground. Last year plants in bloom were brought in on either the 12th or 22d of February, from the hills two or three miles north of Reno, where they were found on a moist flat. The plant used for the cover illustration was collected at Verdi on March 30, 1902, by J. C. Bray. The flowers are apparently white, but may have faded. Two other colleetions are: Verdi, February 10, 1896, F. H. Hillman; Washoe, March 10, 1895, F. H. Hillman.

Douglas first collected this species, and Hooker, who published it in Fl. Bor. Am. **1**: 12. *pl. 5. A.* 1829, gave it as "common on the mountains around the Kettle Falls [Washington], and on the Rocky Mountains, near the limits of perpetual snow." The root leaves were described as roundish, entire, or obtusely three-lobed at the apex; the stem leaves cuneate, three-lobed nearly to the middle: His illustration shows all of the basal leaves entire. Our plant is young, and accordingly the long slender petioles of the basal leaves are not so well developed as they would be in a more mature specimen, such as the one collected at Verdi by Hillman. This specimen, unfortunately, is not suitable for an illustration. The specimen from Washoe corresponds rather to *R. ellipticus* Greene, Pittonia **2**: 110. 1890. It too is a young plant, with all the leaves, both root and stem, elliptical and entire.

Hooker states that "the whole plant has a succulent appearance, and turns almost black in drying." The fact that it became black in drying was no doubt due to the treatment it got, and not to any inherent characteristic of the plant. Very few plants blacken if properly cared for. Even *Baptisia tinctoria* of the eastern states, which invariably blackens under the ordinary treatment, can be kept green if the branches and leaves are not allowed to overlap, and an undue amount of moisture prevented from accumulating in the driers.

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The genus *Ranunculus* is sparingly represented in Nevada, but several species are found in favorable situations. They are moisture loving plants, and are always found in permanently damp places or come up and bloom in early spring while there is an abundance of moisture.

A near relative of *R. glaberrimus* is *R. oxynotus* Gray, Proc. Am. Acad. **10:** 68. 1874, which was originally collected in "California near the summit of Castle Peak, Sierra County, at 9,000 feet, J. G. Lemmon." Castle Peak, however, is not in Sierra county, but in Nevada county, and lies due north of Summit station on the Central Pacific railroad, distant some four or five miles. This species has been found in Nevada on Mt. Rose near Reno, at elevations of 9000 to 10800 feet, and in bloom from June to October. It is partial to northerly slopes, and may be looked for in the moist gravel or sand immediately below a snow bank. A short distance below the snow may be found well developed plants with open flowers and perhaps well developed heads of fruit, while on the very edge of the snow are plants just appearing above ground, and others with opening buds. It grows in a region where laggards have no place in the economy of nature. Here the growing season is short, for spring comes during either the midsummer or autumn time of the lowlands, and the plants make the most of their few short weeks of life. This species, like *R. glaberrimus*, has roundish root leaves, but they are crenate rather than lobed, and the stem leaves have more numerous and deeper lobes.

R. digitatus Hook. Fl. Bor. Am. **1:** 12. *pl. 5.* 1829, according to Watson originally collected by Burke near Fort Hall in southeastern Idaho, was found by Watson "on Mt. Tobin Range, above Cumberland, Nevada." This place is not given on recent maps, but is situated in Humboldt county southeast of Winnemucca. This species, according to the Synoptical Flora is distinguished from the ones mentioned above by the "radical leaves either entire and lanceolate or, like the few subsessile cauline, 2-parted into oblong-lanceolate or almost linear lobes." It is also an alpine or subalpine species, the elevation of the Nevada station being given as 9000 feet.

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R. alismellus (Gray) Greene, Fl. Fran. 297. 1891. This also, if our plants are rightly referred, is subalpine or nearly so with us. The originals from "Lake Tenayo and on Mt. Dana, Sierra Nevada, to the height of 12,000 feet" (Gray, Proc. Am. Acad. **7**: 327. 1867), had subovate or oblong leaves an inch long, on usually slender petioles. Our specimens, collected on Slide Mountain, a massive granite peak elevation 10000 feet, and just south of Mt. Rose, have leaves with lanceolate acute blades about three inches long, and rather broad petioles two inches long. The flowers are over an inch in diameter, bright glossy yellow. I have seen similar plants at an elevation of over 8000 feet, growing below snow banks in Placer county, California, near Summit station.

On the Ruby mountains in Elko county, eastern Nevada, I collected a Ranunculus which is probably referable to *R. Eschscholtzii* Schlecht. Ranunc. **2**: 16. 1820, the type of which was collected by Chamisso "in insulis Unalaschka et St. Georgii." It was found at the head of a canyon, on the South Fork of the Humboldt river, above Lee post office, at an elevation of 9900 feet, growing in wet places along streamlets where snow had recently melted. The plants have the roundish 3-5-parted or deeply cleft leaves of this species, with purplish glabrous sepals. On the Clover mountains, as the northern part of the Ruby mountains is called, was collected a very similar plant, growing on wet slopes below snow banks, the elevation 9150 feet. It differs in having a more conspicuous ciliate and scarious stipular dilation of the leaf, and the calyx is hirsute. Except for the size of the flowers, which considerably exceed the calyx, it agrees fairly well with the description of *R. ocreatus* Greene, Pittonia **4**: 15. 1899, the type of which was collected on Mt. Hesperus, Colorado.

Ranunculus alpeophilus A. Nelson, Bull. Torr. Club **26**: 350. 1899. Specimens collected above Lee post office in the Ruby mountains, elevation 9900 feet, were found sparingly in moist places where snow had recently melted. This agrees very well with Professor Nelson's no. 7880, collected at Telephone Mines, Albany county, Wyoming, except that it is taller and

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more slender, and has fewer leaves. Although originally compared with *R. Eschscholtzii*, it is a taller plant, with flowers not much more than half as large, the petals and sepals much narrower.

According to Watson, Proc. Am. Acad. **14**: 289. 1879, the plant described in the Botany of the Ring Report 7, as *R. alismaefolius* var. *montanus* "is the typical subalpine form as found by Geyer," while in the Synoptical Flora it is said to be "one of the intermediate forms." So far this plant has not been found in our collections.

The above are the alpine and subalpine species thus far recorded from Nevada. In addition the following species occur at lower elevations:

R. Purshii Rich. App. Frankl. Journ. ed. 2, 751. 1823, is said to have come originally from "wooded country from latitude 54° to 64° north. It is a creeping plant, found in wet, usually muddy places, growing in tangled masses, the leaves all deeply lobed and cleft, the flowers rather small, less than a half inch in diameter. We have it from two stations in Elko county, Little Lakes canyon, and at the Humboldt Wells, where it grows in more or less alkaline soil, the elevation 5630 feet. Nuttall, in Torrey and Gray's Flora gives this species the very appropriate name of *R. limosus*. Its range is quite extensive, as it occurs from Alaska on the north to Nova Scotia on the east, and south in the Rocky mountains to New Mexico.

R. eremogenes Greene, Erythea **4**: 121. 1896, has been collected in Elko county near the ruins of Fort Halleck, where it was growing in mud and water in a roadside ditch, the elevation 5800 feet. This is closely related to *R. sceleratus*, an European plant extensively naturalized in the eastern states.

R. Macounii Britton, Trans. N. Y. Acad. **12**: 3. 1892, is probably common in the northern part of the state. It has been collected at various places near Reno, in Paradise valley, Humboldt county, and at Deeth, Elko county. Though related to *R. pennsylvanicus*, it may easily be distinguished by its globose instead of oblong heads of achenes, petals longer than the sepals, and the less sharply lobed leaves. The lower elongated branches are often prostrate and rooting at the nodes.

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Ranunculus ultramontanus (Greene)

Ranunculus occidentalis var. *ultramontanus* Greene, Pittonia **3**: 13. 1896.

This was originally described from material obtained on "banks of streams and lakes, or in moist meadow lands along the Truckee river, at the eastern base of the Sierra Nevada, Calif." It is not uncommon along the Truckee in the vicinity of Reno, and has been found in Washoe valley between Reno and Carson, and on the slopes of the Sierra southwest of Reno, at an elevation of 6500 feet, in a wet mountain meadow. The type of *R. occidentalis* was collected on "plains of the Oregon River, near woods," by Nuttall, and the type, or a co-type is in the Torrey Herbarium at the New York Botanical Garden. It was described as "hirsute with shining spreading hairs; leaves trifid or 3-parted; segments cuneate and trifid, or incisely toothed, the lateral ones often subdivided; the uppermost leaves trifid, with linear acute segments; stem divaricate, many flowered; sepals reflexed, half as long as the elliptical-oblong petals; carpels smooth, much compressed, with the revolute style nearly their own length." Mr. E. P. Sheldon has distributed specimens of fairly typical *R. occidentalis*, no. 10104, from the Dalles, Oregon. As described by Dr. Greene, our plant is distinct from *R. occidentalis*, differing in having leaves of another shape cut into long and narrow segments; is obviously pubescent only below instead of strongly so even to the sepals; has a much smaller flower, and much smaller achenes with shorter, less curved style.

Besides true *Ranunculus*, several of the segregates also occur in Nevada, among them one or more species of *Batrachium*, with white flowers and finely dissected leaves. *Halerpestes Cymbalaria* is fairly common, usually in alkaline soil. *Beckwithia Andersonii* is found on the slopes of the Sierra near Reno.

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NEW COMBINATIONS—II

By A. A. Heller

(Continued from volume 5, page 120)

Sphenopholis annua (Suksd.)
Eatonia annua Suksd. West. Am. Sci. **15**: 50. 1906.

Sphenopholis aristata (Scribn. & Merrill)
Eatonia aristata Scribn. & Merrill, U. S. Dept. Agric. Div. Agrost. Circ. **27**: 7. 1900.

Sphenopholis glabra (Nash)
Eatonia glabra Nash, in Britton, Man. 1043. 1901.

Sphenopholis pubescens (Scribn. & Merrill)
Eatonia pubescens Scribn. & Merrill, U. S. Dept. Agric. Div. Agrost. Circ. **27**: 6. 1900.

Sphenopholis robusta (Vasey)
Eatonia obtusata var. *robusta* Vasey; Beal, Grasses N. A. **2**: 493. 1896.
Eatonia robusta Rydb. Bull. Torr. Club **32**: 602. 1905.

Poa lacustris
Poa flexuosa var. *occidentalis* Vasey; Rothrock, Rep. U. S. Geol. Surv. **6**: 290. 1878.
Poa occidentalis Rydb. Mem. N. Y. Bot. Gard. **1**: 50. 1900. Not *P. occidentalis* Vasey, 1893.

Cyperus Nortoni
Cyperus longispicatus Norton, Trans. Acad. St. Louis **12**: 37. *pl.* 5. 1902. Not Boeckl. Allg. Bot. Zeit. **2**: 18. 1896.

Juncoides saltuense (Fernald)
Luzula saltuensis Fernald, Rhodora **5**: 195. 1903.

Anticlea alpina (Blankinship)
Zygadenus alpinus Blankinship, Mont. Ag. Coll. Sci. Stud. Bot. **1**: 44. 1905.

Anticlea longa (Greene)
Zygadenus longus Greene, Pittonia **4**: 240. 1901.

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ANNOUNCEMENT

A new edition of the Catalog of North American Plants is in preparation. Thus far 84 pages have been printed, and other parts will follow as fast as possible. In all there will be about 300 pages. Since a considerable time must elapse before the work can be completed, the 84 pages and other parts as soon as issued, will be sent to those who wish to have them in that form, for $1.25, payment to be sent with the order.

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A. A. Heller,

539 West 5th street, Reno, Nevada

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MAR 1910

Volume 6 Number 2

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FEBRUARY, 1910

Editors: A. A. HELLER and P. BEVERIDGE KENNEDY

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Volume 6 March 14, 1910

MUHLENBERGIA

THE NEVADA LUPINES—III

By A. A. Heller

(Continued from volume 5, page 153)

Before taking up the subgenus Lupinus, I wish to thank Dr. B. L. Robinson, of the Gray Herbarium, who has kindly sent me fragments of several types, by means of which I have been able to determine the flower structure of the species they represent. In all cases they have proved to be distinct from our Nevada plants, but without this confirmation it would be unwise to form any definite opinion. I am also greatly indebted to Miss Alice Eastwood, now working at the Gray Herbarium, who has made critical examination of a number of types and compared specimens sent by me with them, and has generously aided me in every way possible. To Dr. H. M. Hall, of the University of California, I am also indebted for the loan of extensive suites of specimens from their herbarium, and which have been consulted in the preparation of this paper.

The annual lupines are comparatively easy to define in a satisfactory way, but when one takes up the perennials he encounters a much more complicated problem. In the treatment of these there will probably be considerable difference of opinion, for there is here an opportunity for either much "lumping" or much "splitting." Environment seems to play an important part in their development. I use the word "seems" advisedly, for little is known about the subject, and only an opinion can be given, unsupported by actual knowledge.

After a number of years have been spent in experimenting with plants that have been transposed from low to high altitu-

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des, from dry to comparatively moist conditions, and to every other combination of changed habitat, we will be in a position to begin to say something definite. Such experiments I am preparing to make, and in the meantime in these preliminary studies will thoroughly describe as new, as well as figure, all forms that seem to differ from recognized species sufficiently to deserve a name. Later and better knowledge may cause a reversal of opinion in some cases.

As previously mentioned, there are excellent characters in the flowers, but by most writers the flower is hardly mentioned except to give its color when known, and its length. One who has observed lupine flowers in the field can very readily discern the original shape and peculiarities even in the dried state when he carefully dissects it. And those who do not know the genus in the field could do much better with them if they would.

The size of the flower is fairly constant in most species, and the shape of the parts seems to be uniform, but there is some variability in the toothing of the calyx and the amount of pubescence on the keel.

The expression "calyx spurred" is commonly used in speaking of certain species, but in reality the calyx is never spurred. On the contrary it is the claw of the banner that bears the spur, and the calyx being on the outside of this, must necessarily accommodate itself to the shape of whatever is inside of it. The calyx is not affixed to the claw of the banner, but fits over it like a glove, and when carefully peeled off shows the pouch-like depression where the claw fitted into it.

The fully developed pods, while varying in length even on the same plant, are fairly uniform in width for any given species. The number of seeds in the pod seems to be pretty uniform.

Since the Nevadan perennial species are as yet imperfectly known, I shall not here attempt a key for all of them, but will arrange them in groups.

Subgenus II. LUPINUS.

Annual or perennial: cotyledons fleshy, distinctly petioled and somewhat persistent in some annual species: stems either

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entirely herbaceous or in a few species shrubby and persistent: flowers white, yellow, or some shade of blue or violet, the banner nearly plane in the very small flowered species, its sides reflexed in the large flowered ones, the claw in some species produced into a bluut spur: pods oblong to linear, containing three or more seeds.

Annuals

Plants low, diffusely branched from the base, densely canescent with fine and long spreading hairs: inflorescence usually not exceeding the leaves: flowers narrow, purple	*Concinni*

Perennials

Tall plants growing in wet places, with herbaceous, succulent and thick hollow stems: basal leaves long petioled: herbage commonly light green, its pubescence scanty: flowers usually violet	*Polyphylli*
Low plants with many short stems from a deep-seated taproot: inflorescence exceeding the leaves: flowers usually bluish or violet-purple	*Cespitosi*
Prostrate plants the stout stems from a spreading, branched woody caudex: flowers small, violet-blue	*Prostrati*
Medium sized to tall plants, the stems rather slender, not succulent	
Flowers conspicuously spurred or saccate at base	*Calcarati*
Flowers subsymmetrical at base	*Ecalcarati*

Concinni

Lupinus micensis Jones, Proc. Cal. Acad. II. **5**: 630. 1895.

Caulescent, "two to six inches high, branching from the base and lateral stems decumbent; whole plant even to the calyx and pods sparsely long- and silky-villous or in some cases quite densely so, the hairs always spreading and soft:" petiole of cotyledon 4 mm. long, the blade orbicular, 4 mm. across: "petioles usually 3 to 4 times the leaflets:" stipules subulate, about 4 mm. long: leaflets about 8, oblanceolate or spatulate, 15 mm. long or less, 5 mm. wide, rounded and obtuse at the apex: peduncle very short, it and the inflorescence not exceeding the leaves: bracts subulate-lanceolate, 2.5 mm. long, only slightly exceeding the pedicel: entire calyx 5 mm. long, the upper lobe 2 mm. long, 2-parted to the base into lanceolate teeth; lower lobe 3 mm. long, 2-toothed; sinus bractless: flowers "reddish-purple," 7 mm. long, 5 mm. deep; banner with the sides somewhat reflexed, or-

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bicular-ovate when spread out; wings moderately inflated, obliquely obovate when spread out; keel moderately curved, glabrous: pods 1 cm. long, 5 mm. wide, 3 or 4-seeded: seeds (Rhyolite plant) oblique-rounded, 3 mm. across, not flattened, brownish marbled as well as covered with innumerable black dots.

The above description is partly quoted from the original and partly drawn from the type, which is *Jones 50640*, collected at Mica Springs, Nevada, April 14, 1894. The type itself is in the U. S. National Herbarium, on sheet 365876. Just where Mica Springs is located I do not know, as no county is given, and the name is not found on any of our maps, but it is presumably somewhere in southern Nevada. Besides the type I have seen specimens from but one other place in Nevada, namely, at Rhyolite, Nye county, where I collected it in fruit May 18, 1909, under no. 9681.

L. micensis was originally compared with *L. brevicaulis*, a species belonging to the subgenus Platycarpos, and in no wise related; also in a lesser degree with *L. arizonicus*, which is indeed in the subgenus Lupinus, but bears little or no resemblance

Figure 1. Floral parts of *L. micensis*, enlarged.

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to *L. micensis* in either general appearance or described characters. Its true relationship is with *L. concinnus*, and it was my intention, for a time, to put it down as a synonym of that species. But until I have an opportunity to examine typical material of *L. concinnus*, which, Miss Eastwood informs me, was undoubtedly collected in southern Monterey county, California, in the Santa Lucia mountains, I shall treat it as distinct.

A careful examination of abundant material from California, Arizona and New Mexico, labeled *L. concinnus*, shows several marked forms. The plants all agree fairly well in habit and pubescence, but there is a noticeable difference in the size and color of the flowers, and in their arrangement. Dissection reveals the fact that there is also a marked difference in the shape of the floral parts. There likewise seems to be a corresponding diversity in the seeds. I should esteem it a great favor if both specimens and seeds of what is supposed to be *L. concinnus* be sent to me from as many sources as possible.

POLYPHYLLI

Both of the species included under this section were originally distributed by Professor C. F. Baker, under the names here proposed, with Dr. E. L. Greene as authority. They have stood as herbarium names for the past eight years, and are now published with Dr. Greene's consent. *L. longipes* might be expected to occur in Nevada, but whether it descends to the eastern side of the Sierra is doubtful. One distinguishing feature of that species is a brown seed with a dark diagonal line.

Lupinus elongatus Greene, n. sp.

Herbaceous perennial: stems numerous from a thick rootstock, 9 dm. high or less, stout, often 1 cm. across near the base, hollow and somewhat succulent, glabrous to the naked eye, but sparingly pubescent with short appressed hairs, especially above, greenish-yellow or purplish: petioles of the lower leaves very long, often 2 dm. or more, dilated at base, those of the other leaves successively shorter; stipules of the lower leaves 2 to 3cm. long, a little more than 1 mm. wide, adnate to the petiole for three-fourths theri length, the free portion lance-subulate, some-

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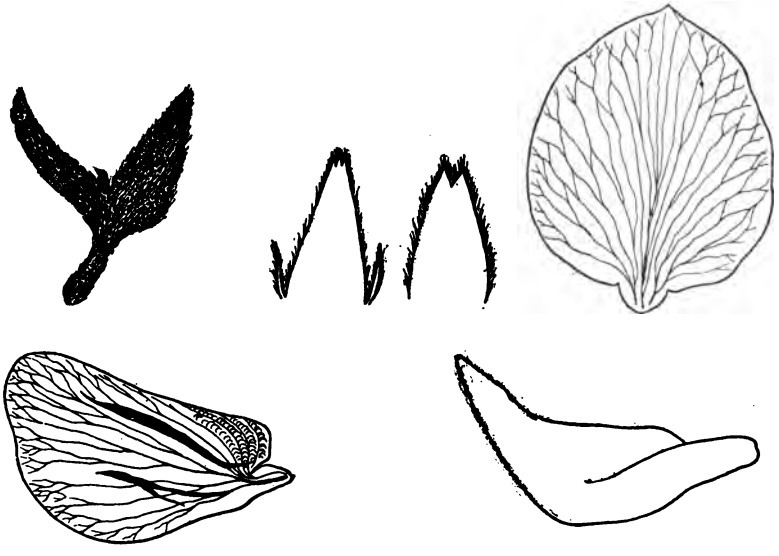

Figure 2. Floral parts of *Lupinus elongatus*, enlarged.

what pubescent; leaflets variable in number, but usually 7 to 9, elliptical-lanceolate, 4 to 7 cm. long, 13 mm. wide or less, rather bright green above, somewhat glaucescent and appressed pubescent beneath, the acute apex apiculate: peduncles exceeding the leaves, usually about 7 cm. long: inflorescence elongated, frequently 3 dm. long, verticillate or sub-verticillate, the lower internodes longer than the flowers: bracts exceeding the calyx, subulate-acuminate, 12 mm. long, densely villous, caducous: pedicels slender, 4 or 5 mm. long, appressed pubescent: flowers bright violet-blue, 12 mm. long, 10 mm. deep, distance between apices of banner and wings 4 mm. calyx white-silky, the pubescence both appressed and spreading, the lobes nearly equal, the upper 6 mm. long, prominently 2-toothed, the lower 7 mm. long, narrow and pointed, strongly convex dorsally when fresh, slightly 3 toothed, the middle tooth longest: banner with sides reflexed, the edges meeting and slightly inrolled, the face narrow and deeply grooved, the apex extending on the back into a sharp and rather deep keel-like projection; wings only moderately inflated, the edges meeting except under the calyx, the

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upper ones raised into a sharp knife-like line, with a rather deep wrinkle or trough on either side, the pair 5 mm. wide; individual wings 8 mm. broad when spread out, well rounded on the lower side, the upper almost straight, the claw very short, only 1 mm. or a little more in length; keel moderately curved, glabrous, 4 mm. deep across the middle: pods 2.5 cm. long or less, 7 mm. wide, densely tawny pubescent with long spreading hairs, 5 to 7-seeded: seeds chocolate-brown when mature, 4 mm. long, 3 mm. wide, smooth, rather dull.

The type, in the herbarium of A. A. Heller, is *Baker 1135*, collected in July, 1902, at Spooner, Douglas county, Nevada. The description of the pods and seeds is drawn from *Heller 9774*, collected June 28, 1909, in wet meadows at Franktown, Washoe county, Nevada, elevation 5000 feet, where it is plentiful. This specimen is in the herbarium of the Nevada Agricultural Experiment Station.

This species is probably referred to under the description of *L. Burkei:* "On the east side of the Sierra; near Carson City (46 Anderson, 262 Stretch)." But Miss Eastwood informs me that the type of *L. Burkei* from the "Snake country" is not the same as our Nevada plant. Dr. Robinson has kindly sent me a fragment of the type, and from this a drawing has been made which shows that *L. elongatus* has very different characters.

Besides the Nevada specimens mentioned, we have *L. elongatus* from Red Clover valley, California, my no. 8715, collected in 1907. This, according to my notes, differs only in having the flowers creamy-white, fading brown. I long ago associated it with the type of *L. elongatus.* The flower characters are identical, color being the only difference. The long bracts on the undeveloped flower-spikes are a prominent feature of this species.

Lupinus procerus Greene, n. sp.

Herbaceous perennial: stems numerous from a thick rootstock, 6 dm. high, stout, 1 cm. in diameter near the base, hollow, more or less purplish, scantily appressed pubescent with short hairs: lowermost leaves on petioles 1 dm. long, with an

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enlarged clasping base; stipules of these 3 cm. long, adnate except the upper third, which is subulate-acuminate, those of the upper leaves barely half as long, nearly free; leaflets 6 to 9, the lowermost spatulate, 2 cm. long, 8 mm. wide, the apex blunt and rounded, the others broadly oblanceolate, 7 cm. long, 1.5 cm. wide, acutish and apiculate, all sparingly appressed pubescent on both sides, glaucescent beneath, pale green above: peduncles about 1 dm. long: inflorescence somewhat sub-verticillate, rather lax below: bracts 1 cm. long, subulate-acuminate, pubescent, caducous: pedicels 5 mm. long, pubescent with short, somewhat appressed silky hairs: flowers bright violet-blue, 12 mm. long

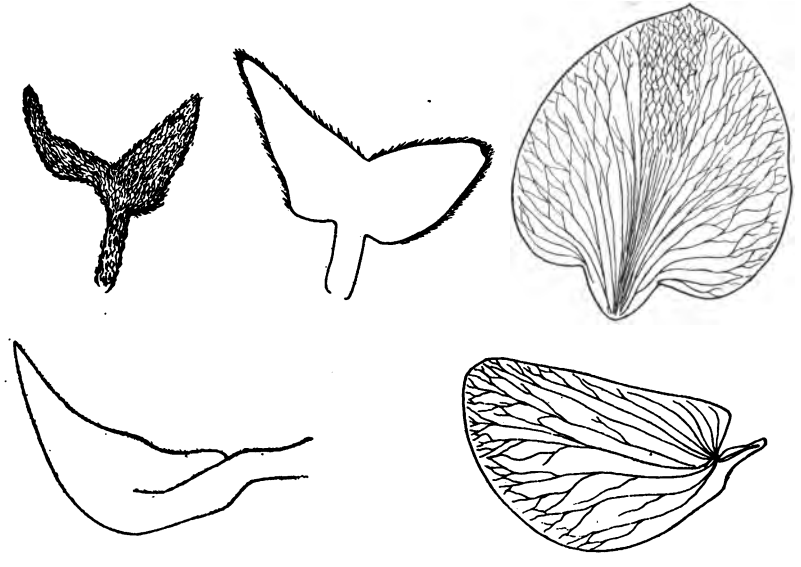

Figure 3. Floral parts of *Lupinus procerus*, enlarged.

and as deep, distance between apices of banner and wings 5 mm.: upper calyx lobe 5 mm. long, almost truncate, with merely a broad shallow notch, the apex nearly 4 mm. broad when spread out, the lower lip entire, 8 mm. long, narrow-convex dorsally and sharp pointed in nature, broadly lanceolate when spread out: banner with sides turned back and nearly meeting, but the edges not inrolled, face narrow, with a deep groove, ending at the apex in a pouch which extends on the back into a point 1 mm. or a

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little more in length, but is depressed below the apex, claw somewhat blunt spurred; wings rather widely inflated, 8 mm. deep, united below the apex for 4 mm., from thence open below and exposing the keel, the upper edges with a broad and shallow groove on either side; keel strongly curved, 5 mm. deep at the middle, glabrous, purple tipped: pods 3.5 cm. long or less, 1 cm. wide, white woolly, the hairs short and not remarkably dense: seeds large, 5 mm. long, 4 mm. broad, slightly flattened, gray, mottled and marbled with brown, with a more or less distinctly marked oblique brown line.

The type, in the herbarium of the Nevada Agricultural Experiment Station, is *Heller 9902a*, collected July 29, 1909, on Mt. Rose, Washoe county, Nevada, at an elevation of 9650 feet. It is abundant at that elevation on the northern flank of the mountain in wet places, growing in company with *Castilleja*, *Elephantella*, *Salix*, and other moisture loving plants.

Other specimens from Nevada are: *Baker 1376* from Snow valley, Ormsby county, and *1349* from Clear Creek canyon, Ormsby county, distributed as "*Lupinus procerus* Greene, n. sp. f." These are both fragmentary, showing only the upper part of the plant, hence neither of them were selected as the type. *Kennedy 1186*, collected August 17, 1905, is from type locality, and is labeled *L. rivularis*. The description of the pods and seeds is taken from *Kennedy 975*, collected at Glenbrook on Lake Tahoe, October 31, 1904.

This species is related to *L. elongatus*, but differs in its thicker, less pointed glaucescent leaves, and especially in the flower, which, although of the same color, is of a different shape and has a much more evident spur. The pubescence of the calyx is more appressed and the lobes entire. The edges of the banner while turned back and parallel do not meet and inroll, and the claw of the wing is very short. The pods are broader, the pubescence much shorter, more appressed, gray instead of tawny, and the larger seeds gray and marbled instead of a uniform chocolate-brown.

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CESPITOSI

This section contains four species, which fall into two groups of two species each. Two of them, *L. alpinus* and *L. pinetorum* are low matted plants with decumbent or procumbent stems, the flowering ends raised only slightly above the surface of the ground. The other two, *L. sellulus* and *L. confertus*, while having the outer stems more or less decumbent, are ascending or erect, sometimes almost or quite a foot high. The peduncles, exclusive of the inflorescence, commonly extend beyond the leaves in all these species.

Lupinus alpinus Heller, n. sp.

Low cespitose perennial, with a deep-seated tap-root often 2 dm. long: branches usually many, decumbent, forming mat-like masses 1 dm. or less in diameter: whole plant more or less villous, the peduncles and calyx especially whitened, the pubescence somewhat appressed: leaves numerous, the petioles 4 or 5 cm. long or less; stipules subulate, 4 mm. long, long-villous; leaflets commonly 6, oblanceolate, 1 cm. long, 4 mm. wide, acutish, yellow-green above, pale beneath: peduncles exceeding the leaves, about 7 cm. long: inflorescence dense, capitate or short-cylindrical, not pointed, rarely over 2 cm. in length: bracts subulate, 5 mm. long, drying brown, white bearded but not densely so, persistent: pedicels short, less than 2 mm. long: flowers violet-blue, 8 mm. long, 5 mm. deep, distance between apices of wings and banner 2 mm.: calyx with a small bractlet on the outside *below* the sinus, the lobes nearly equal, 4mm. long, the upper 2 mm. wide when spread out, 2-toothed, the teeth very slightly incurved at the apex, the sinus fairly wide; lower lobe 1.5 mm. wide, 3-toothed, the middle tooth a little longer: banner with sides turned back and parallel, the face white, fading yellowish, the whole elliptical-obovate when spread out, 6 mm. wide, pointed on the back at the apex; wings oblong, 4 mm. deep, narrowly inflated, united only at the apex, but the edges meeting except under the calyx lobe and just above it, a slight depression on either side of the upper edges, appearing as if longer than the banner; keel moderately curved, nearly straight on the

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inside, 3 mm. deep at the middle, shortly bearded and purple on the upper half: pods ovate-oblong, 7 mm. long, 4 mm. wide, 3-seeded: seeds roundish, somewhat flattened, 2 mm. across, whitish, unspotted, smooth.

Figure 4. Floral parts of *Lupinus alpinus*, enlarged.

The type, in the herbarium of the Nevada Agricultural Experiment Station, is *Heller 9914a*, collected July 29, 1909, on Mt. Rose, Washoe county, at an elevation of 9650 feet, where it is abundant, growing in open forests of *Pinus albicaulis*, in granitic gravel. Its upper limit is at 10100 feet, where it is found at the edge of the timber line on a warm southeasterly exposure. I have some recollection that it is also found above timber line in the depression or saddle on the north side of Mt. Rose proper. This is above the granite, the formation being slate or shale.

This species is near the Californian *L. Lobbii*, a plant that was very imperfectly described, but ours differs from the type of that species in having a smaller and narrower flower, although the calyx is practically the same. Dr. B. L. Robinson, of the Gray Herbarium, has kindly sent me flowers from the type of *L. Lobbii*. *L. alpinus* is peculiar in having a bractlet on the outside of the calyx below the sinus, though so obscured by the pubescence that it is easily overlooked. The species has as yet been found in Nevada only on Mt. Rose.

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Although *L. Lobbii* does not properly come under the province of this paper, some interesting facts concerning it have been discovered. Never properly described, it is impossible from literature to determine definitely what the plant may be. Knowing that the species now described as *L. alpinus* belonged to the same group, I felt that it would be unwise to either describe it as new or to call it *L. Lobbii* without obtaining more information about the latter species. Miss Eastwood informed me that Lobb's specimen is in England, and that it is not really the type. Watson drew up the description, such as it is, from *Brewer 2085* in the Gray Herbarium. This, as already noted, differs considerably from our Mt. Rose plant.

Through the kindness of Dr. H. M. Hall, of the University of California, I have been able to examine their specimen of *Brewer 2085*, which is said to occur "over all dry hills" near Ebbett's Pass, California. From the evidence at hand, it seems likely that Brewer included more than one thing under his no. 2085, for the floral parts of the specimen in the herbarium of the University of California are shorter and broader than are those of the type, and resemble very much those of *L. alpinus*. The inflorescence, though, is more elongated than is that of *L. alpinus*. With the possibility that Brewer confused two different plants under one number, one can not be at all sure that Lobb's specimen, which theoretically should be the type of *L. Lobbii*, is of that species. It may be something quite different.

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ANNOUNCEMENT

A new edition of the Catalog of North American Plants is in preparation. Thus far 100 pages have been printed, and other parts will follow as fast as possible. In all there will be about 300 pages. Since a considerable time must elapse before the work can be completed, the 100 pages and other parts as soon as issued, will be sent to those who wish to have them in that form, for $1.25, payment to be sent with the order.

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Lupinus sellulus Kellogg

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Volume 6 March 31, 1910

MUHLENBERGIA

THE NEVADA LUPINES—IV

By A. A. Heller

(Cespitosi—concluded)

Lupinus pinetorum Heller, n. sp.

Cespitose perennial with a stout tap-root: stems numerous, procumbent, 2 dm. long or less, pubescent with spreading white hairs: petioles slender, pubescent like the stems, about 4 cm. long; stipules brownish, subulate, 5 mm. long, densely white bearded; leaflets commonly 5, oblanceolate, 12 or 13 mm. long, 5 mm. wide, acutish and very shortly mucronate, densely pubescent, the hairs rather appressed, silvery on the lower surface,

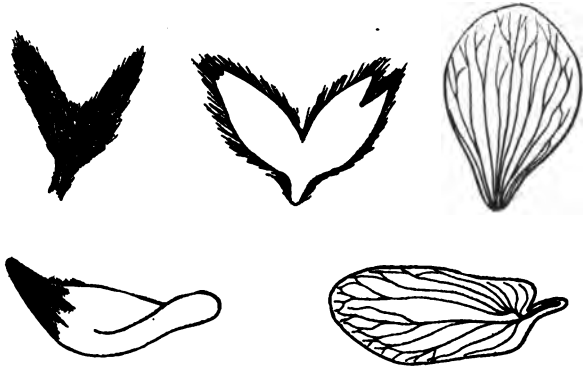

Figure 5 Floral parts of *Lupinus pinetorum*, enlarged.

but the green showing through on the upper, the edges ciliate: peduncles commonly exceeding the leaves: inflorescence cylindrical, up to 8 cm. long, nearly 2 cm. across, dense, not verticillate: pedicels 2 mm. long, pubescent like the leaves: bracts 3mm. long, subulate, brownish, caducous, or sometimes semi-persistent: flowers violet-blue, 8 mm. long, 5 mm. deep, distance between apices of banner and wings barely 2 mm.: calyx silky villous,

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Plate 1

Lupinus pinetorum Heller

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the lobes nearly equal, the upper 2 mm. long, 2 mm. wide when spread out, prominently 2-toothed, the lower 3 mm. long and nearly as broad when spread out, shortly 3-toothed: banner round obovate when spread out, 7 mm. long, 5 mm. wide, the sides somewhat reflexed, the face with a whitish spot turning red in age; wings but little inflated, open below and exposing the keel, oblong, 8 mm. long, 3 mm. deep; keel rather strongly curved, 3 mm. deep across the middle, ciliate in the upper half, the purple apex rather bluntly pointed: pods 11 mm. long, 5mm. wide, white silky, the hairs rather appressed, 3-seeded, the seeds (immature) grayish, smooth.

The type, in the herbarium of the Nevada Agricultural Experiment Station, is *Heller 9748*, collected June 11, 1909, on the ridge south of Alum creek, Washoe county, Nevada, at an elevation of about 6500 feet. It is plentiful at one place in gravel in open pine woods, the procumbent stems often forming a good sized mat.

This is also related to *L. Lobbii*, and in general appearance somewhat resembles no. 2085 of Brewer in the herbarium of the University of California. It is also related to *L. alpinus*, but differs in the first place in the greatly elongated cylindrical inflorescence, and has smaller flowers. While the calyx lobes of the two are very similar, the floral parts are different, as may be seen by comparing the illustrations. The bracts at the base of the calyx are much less persistent in *L. pinetorum*, and the bractlet on the outside of the calyx is wanting.

Besides the type we have a specimen collected by Professor S. C. Dinsmore in Hunter creek canyon, at a point two or three miles north of the type station, June 20, 1907, elevation 6000 feet. This is the plant mentioned in Nevada. Agr. Exp. Sta. Bull. **71**: 30. *pl. 14.* 1909, having been used in a sheep feeding experiment. It proved to be a good forage plant, and was relished by the sheep.

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LUPINUS SELLULUS Kellogg, Proc. Cal. Acad. **5**: 36. 1873.

Perennial from a slender tap-root, up to 2 dm. high, silvery silky pubescent throughout, practically acaulescent, the numerous ascending stems and petioles sub-decumbent at base, finally erect or ascending, spreading: petioles 7 cm. long or less: stipules subulate, 4 or 5 mm. long; leaflets 6 to 8, oblanceolate, 15 mm. long, 5 mm. wide, apiculate and hairy-tufted at the narrowed apex, the pubescence dense, appressed: peduncles commonly 1 to 3 cm. longer than the leaves: inflorescence cylindrical, up to 7 cm. long, 1.5 cm. broad, sub-verticillate, dense: bracts persistent, lance-subulate, nearly as long as the calyx, densely bearded: pedicels very short, but little over 1 mm. long: flowers violet, 8 or 9 mm. long and as deep, distance between apices of banner and wings 4 mm.: calyx densely silky, the lower lobe prominently 2-toothed, 4 mm. long, upper lobe broader, 3 mm. long, 2-cleft, the apices of the divisions slightly

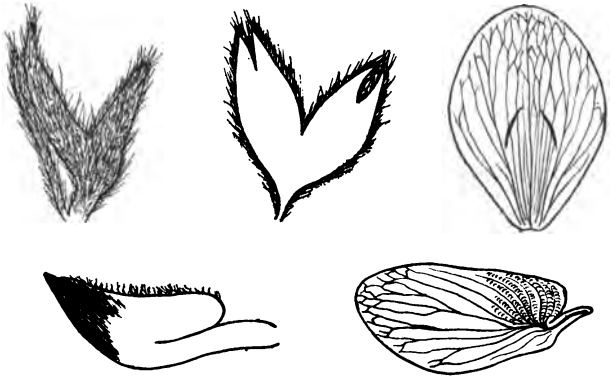

Figure 6. Floral parts of *Lupinus sellulus*, enlarged.

converging: banner with the sides turned back and parallel, forming a scoop shaped body viewed from the rear, the face with a pale spot that turns purple in age; wings oblong, a little longer than the banner, 4 mm. deep, the upper edges raised into a sharp knife-like edge, with a shallow groove on either side, the lower edges open except near the apex, the opening 2 mm. wide; keel not strongly curved, 3 mm. deep for nearly its whole length, bearded, especially near the purple apex: pods silky,

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1 cm. long, nearly 4 mm. wide, 3 or 4-seeded, the seeds 3 mm. across, somewhat flattened, whitish or pinkish, smooth.

As described by Kellogg, this has "a very neat, symmetrical stool, of deep lilac blue spikes involved in dense clustered foliage of much beauty, with the aspect of an annual. Found at Donner Lake, summit of Sierra Nevada mountains, California, July 14th, 1870." It is still abundant in low sandy ground at the lower end of Donner Lake, where I collected it last July under no. 9829. My no. 6864, collected at the same place in 1903, distributed as *L. minimus*, is this species. There can be no doubt concerning this determination, for Miss Eastwood has compared my specimens with the type.

Kellogg says the lower calyx lobe is occasionally 3-toothed. His first statement, "stem suffrutescent," is an obvious error, for the plants themselves do not show such a character, and there is no lupine in this region except perhaps *L. Brewerí* that might be said to have a suffrutescent stem. His later statement, "with the aspect of an annual," is, however, very appropriate. Dr. Kellogg's descriptions are, as a whole, excellent, and one can usually determine his species from them, but occasionally he made statements that can not be reconciled with the facts.

Lupinus Torreyi Gray, is said to be a synonym of *L. confertus*, and so far as concerns the original, collected by Torrey at Washoe Lake, this is no doubt true, but Torrey's 89 from near Donner Pass is no doubt *L. sellulus*.

L. sellulus is related to *L. confertus*, but may be easily recognized by its lower stature, more compact growth, and smaller more numerous leaves, which although strongly pubescent, are not so silvery, and by the narrower raceme of smaller flowers. It has as yet been found but sparingly in Nevada, and all the specimens except one are from Washoe county. The exception is *C. F. Baker 1374*, collected in Snow Valley, Ormsby county, in 1902, distributed as a new species, but fortunately not described. It differs from material from type locality in having a slightly more open growth, and the lower calyx lobe is minutely 3-toothed instead of prominently 2-toothed. The shape of the calyx is the same, and the floral parts are of the same size and

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shape. It was collected at an elevation of 8000 feet or more. The Washoe county specimens are: *Kennedy 1423*, collected at Incline, near Lake Tahoe, elevation 6500 feet, labeled *L. confertus;* a specimen collected at Bijou, Lake Tahoe, by *Hillman* in 1894, and one from Reno in 1890 by *Hillman.*

LUPINUS CONFERTUS Kellogg, Proc. Cal. Acad. **2**: 192. *f.* 59. 1862.

Perennial, densely white silky throughout, the pubescence mostly appressed, but with some spreading hairs: stems several from a stout and deep-seated tap root, 3 dm. high or less, densely leafy below, less so above; lower petioles slender, 5 or 6 cm. long, the upper somewhat reduced; stipules subulate, 5 mm. long; leaflets about 7, elliptical-oblanceolate, 2 cm. long, 6 or 7 mm. wide, acutish at the apex: peduncles short and rather stout, 2 to 4 cm. long, exceeding the leaves: inflorescence dense, often 1.5 dm. long, 3 cm. across: bracts persistent, 9 mm. long,

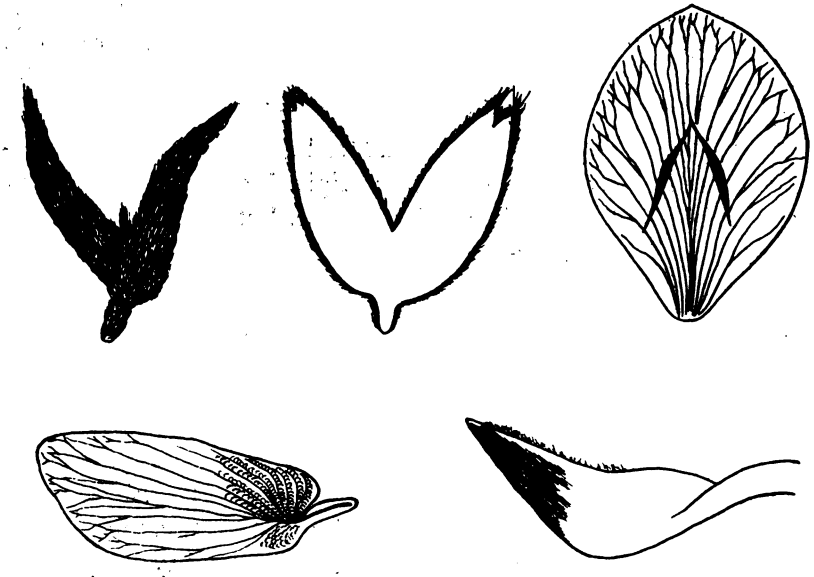

Figure 6. Floral parts of *Lupinus conferuts*, enlarged.

subulate-acuminate, membranous: pedicels very short, 1 mm. long: flowers sub-verticillate, contiguous, violet-purple 12 mm. long, 8 or 9 mm. deep, distance between apices of banner and

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wings 2 mm.: calyx densely white silky, the upper lobe 5 mm. long, shortly 2-toothed, the lower 7 mm. long, obscurely 3-toothed, a tuft of hairs in the sinus in lieu of a bractlet: banner somewhat elliptical-ovate when spread out, 12 mm. long, 9 mm. wide near the middle, the sides reflexed and probably nearly parallel, the face 3 mm. wide below with a deep groove, back glabrous, the base slightly tumid but not spurred; wings moderately inflated, open on the lower half and exposing the keel, obliquely-oblong, 5 mm. wide near the middle; keel moderately curved,short-acuminate, the upper third purple, the hyaline ventral edges more or less ciliate: pods about 13 mm. long, 6 mm. wide, densely white silky villous, 3 or 4-seeded, the seeds 3 mm. long, 2 mm. wide, whitish, smooth, somewhat flattened.

The type locality of this species is not given, but it was probably collected about Washoe Lake, Washoe county, Nevada, where it is common. It is a very handsome species, the dense spikes of bright violet-purple flowers occupying the upper half of the plant, while the stem and leaves are whitened by a silvery, silky pubescence. With us it inhabits moist sandy places both in the woods and in meadows. At Franktown, where I found it in abundance (no. 9772) growing in open damp sandy places in the woods, the plants were rather spreading, but out in the meadows (no. 9778) it was taller and more slender, owing to the fact that it had to contend with the grasses and other plants surrounding it.

In the original description the keel is said to be "silky-ciliate," and the illustration shows it as ciliate except at the very base. This character is subject to some variation, for in some of my Franktown specimens there is a dense tuft of hairs near the apex, gradually thinning out to a little below the middle, the lower third bare, while in other plants there is an evident ciliation almost to the base.

Without having critically examined specimens from outside our range, I may state that the species seems to have a rather wide distribution, occurring from Mt. Pinos in the Tehachapi range in southern California, northward along the Sierra Nevada to western Nevada and adjacent California to at least as far north as Plumas county.

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As stated under *L. sellulus*, that species is probably identical with certain specimens mentioned under *L. Torreyi*, and the latter name may have to be adopted. Both are given as synonyms of *L. confertus* in Watson's Bibliographical Index. Knowing that *L. confertus* is common about Washoe Lake, I should infer that Torrey's plant from that place, which is first mentioned, and theoretically should be the type of *L. Torreyi* is truly *L. confertus*. But Watson's description, such as it is, in the Botany of the King Report, rather indicates a plant similar to *L. sellulus*, and Miss Eastwood says in a recent letter that the specimens in the Gray Herbarium "point that way."

The following specimens of *L. confertus* from Nevada have been examined:

ORMSBY COUNTY: Kings canyon, *C. F. Baker 1110.*

WASHOE COUNTY: About Washoe Lake, *C. F. Baker 1171;* Franktown, *Heller 9772, 9778;* Verdi, *Kennedy 796;* near Reno, *Heizer*, July 31, 1901.

WHAT IS A "SUBSPECIES?"

An Illinois botanist, some years ago, finding some differences in pubescence and intranodal separation among the sunflowers referred to *Helianthus occidentalis*, considered these of sufficient importance to require the segregation of a part under the name *H. illinoensis*. Quite recently another student, by careful observation, was able to demonstrate that this segregate was simply a condition, due mainly to a hydrodynamic cause. He "discovered that plants which in spring and early summer were *H. illinoensis*, were at the time of blooming and fruiting simply *H. occidentalis.*"

Most botanists, having established this fact, would have contented themselves with reducing the segregate to synonymy, and noting under the species its variations under certain conditions. In the present case, however, the investigator "proposes that these plants should bear the name *Helianthus occidentalis illinoensis* comb. nov." It would be more in accordance with the fact to propose that they should bear that name in "the

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spring and early summer," but that in the fall they should be called "simply *H. occidentalis*."

It seems then, that there are botanists who hold that a species and a subspecies may grow from the same root, and on the same stem, at different seasons, may indeed gradually pass from one category to the other as the year rolls by. What boundless possibilities does such a conception open up! What a multitude of plants must be provided with "subspecies!" The case is especially strong for those trees which have very different juvenile and adult foliage. In fact, why is not the bean of early spring, showing only its cotyledons, a good "subspecies" of the very different plant which, *later in the season*, under the stimulus of nutriment, moisture and light, succeeds it at the time of blooming and fruiting?—S. B. P.

RECENT LITERATURE

NEW MANUAL OF BOTANY OF THE CENTRAL ROCKY MOUNTAINS (vascular plants) by John M. Coulter, Ph. D., Professor of Botany, the University of Chicago. Revised by Aven Nelson, Ph. D., Professor of Botany, the University of Wyoming. American Book Company. 1909.

To many of us this book probably came as a surprise, as it did to the writer, who was not aware that it was being prepared. But it was an agreeable surprise. The old "Manual of the Botany of the Rocky Mountain Region" had outlived its usefulness long ago, due to the increased botanical activity, and to the change of ideas concerning plant relationship, and he who would attempt to do any critical work with the plants of the region had to resign himself to the necessity of consulting many volumes in order to identify his plants.

In the old and more thoroughly worked over regions of the eastern states, and where also there is a much wider distribution of any given species, as a rule, than in the regions from the Rocky mountains westward, a manual may be useful for many years without serious need of a revision. Within the past few years this eastern territory has been provided with good modern

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manuals, representing the latest advance in taxonomy. But the great western portion of our country, where the larger number of species are found, has never been represented by a descriptive flora. Several good local floras have been published, especially in California, but this is the first and only work covering more than a single state that is provided throughout with serviceable keys to both genera and species, laying stress on some individual character whereby the genus or species is separated from its nearest relative. A good workable key is one of the most important things about a manual, and the old style keys scattered through the text have fallen into disrepute because they are both unwieldy and unsatisfactory.

It is a neat book, remarkably thin for a volume of 646 pages, being printed on thin but strong paper, and is tastefully bound in brown-olive. The territory covered is the northern half of New Mexico and adjacent Arizona, all of Colorado, Wyoming and the Yellowstone Park, the eastern half of Utah, southern Idaho, most of Montana, and the Black Hills of South Dakota.

In addition to the index, in the back part of the book are found a glossary, summary, abbreviation of author's names, and, most important of all from the standpoint of the bibliographer, a list of new names and combinations. It is a very easy matter for the author of a book in which new names are published, to keep a record of such names and print a list of them in the back part of the book, and it saves a vast deal of time to those whose business it is to make a record of new names. But the author should be careful to record all of the new names. So far this is only the third work in which such a list has appeared, but it is to be hoped that all future manuals and floras in which new names are published may contain one.

The summary shows a total of 116 families, 649 genera, 2733 accepted species, 1788 synonyms, 186 varieties, and a total of 4704 names "accounted for in some way."

As stated in the preface by Dr. Coulter, "the manual is intended to represent current knowledge in reference to the flora for the benefit of the ordinary user of a manual. The profes-

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sional taxonomist will not find in it all of the subdivisions of genera and species that he might wish, but it is thought that this will make it more serviceable to the general user, and that it presents an adequate account of the flora from the more conservative viewpoint."

Many of our active workers no doubt consider the book too conservative, and when we consider that Professor Nelson's writings heretofore could hardly be classed as conservative, the treatment of the plants found within the range of the book comes as a distinct surprise. To an active field worker, whose experience has been that we usually have more distinct species than our books provide for, the total of 2733 accepted species looks too small and the 1788 synonyms too large for such an extensive area, with its vastly different conditions, as governed by altitude, moisture, and all those things which contribute to the differentiation of plant structure.

The summary in Rydberg's Flora of Colorado gives a total of 2912 species, a greater number by 179 for this one state alone than is found in the whole area covered by the new manual. There are species in New Mexico, in Arizona, in Utah, in Wyoming, in the Yellowstone Park, in Idaho, in Montana and in South Dakota, that are not found in Colorado. Opening the book at random, I find in the genus *Musineon* that three of the five species are not credited to Colorado. Were all of these extralimital species searched out, the comparison would be still more at variance. Granted that Rydberg's Flora contains too many species, it does not seem possible that such a great discrepancy should exist.

Should the book be too conservative, the fact will be brought out by those who have occasion to use it in determining plants which occur within the range, and I leave it for them to give a definite opinion on the subject.

From my own knowledge of the genus *Lupinus*, I can point out one error. *Lupinus aduncus* Greene, is not a synonym of *L. Kingii*, for it is a perennial, while the latter is an annual, belonging to the subgenus Platycarpos. Watson, however, described it as a perennial, and is chiefly responsible for any con-

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fusion which may have arisen concerning it. Under *L. laxiflorus* Dougl. are given five possible synonyms. The presence of this species within the range may be doubted, for its type was collected on the lower Columbia river, and most of the perennial lupines have a rather limited range. Two of the supposed synonyms, *L. argentinus* Rydb. and *L. Helleri* Greene, are certainly distinct from each other, and I feel equally certain that neither of them is *L. laxiflorus*.

If, as one may infer from the paragraph quoted above, the book has been made conservative in order to "make it more serviceable to the general user," it seems to me that it has been done from a mistaken point of view. The theory is quite generally held that for the amateur or beginner any sort of jumbling and mixing together is sufficient, and that all he needs is an approximate knowledge of things; that anything precise and exact is not necessary. The amateur and the professional should be treated exactly alike when it comes to writing floras. Various "botanies" and "floras" might be cited which contain certain common or widespread species only, selected from the whole because they are representative. As a result, the users of these books often get hold of related species and give them wrong names, or are utterly unable to determine the plant at hand. It is a distinctly bad habit, and the sooner we quit it, the better.

The book is unique, for a manual, in that the place of publication of the species is cited. This is a very valuable feature, and is greatly to be commended. If one wishes to consult the original description of any species found in the book, he has here a ready reference. This manual will certainly prove very useful, and is a welcome addition to our botanical literature.

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MUHLENBERGIA

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ANNOUNCEMENT

A new edition of the Catalog of North American Plants is in preparation. Thus far 100 pages have been printed, and other parts will follow as fast as possible. In all there will be about 300 pages. Since a considerable time must elapse before the work can be completed, the 100 pages and other parts as soon as issued, will be sent to those who wish to have them in that form, for $1.25, payment to be sent with the order.

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Volume 6 Number 4

MUHLENBERGIA

APRIL, 1910

Editors: A. A. HELLER and P. BEVERIDGE KENNEDY

Viola aurea Kellogg

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University of Nevada,
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Volume 6 May 12, 1910

MUHLENBERGIA

NOTES FROM NORTHERN UTAH—I

By C. P. Smith

Trifolium gymnocarpon Nutt. While in Parley's Park last summer, I picked up a few scraps of this plant, long past the flowering stage. Upon examination, soon after, the leaflets were found to number four and five, as a rule, and I landed nowhere in my attempt to determine the species, supposing number of leaflets to be of some importance. Even Watson, who reports it from this same locality (sagebrush foothills, Parley's Park) and illustrates it, gives no suggestion of more than three leaflets. Nor do I find reference to four or five leaflets in this species in any of the literature at hand.

Sida hederacea (Dougl.) Torr. This species has received my attention, wherever I have met it, because of its apparent lack of frequency in the ripening of its seeds. It is common in the town of Mayfield, College Terrace addition, California, and appears as if native amongst the foothills westward, but many efforts to obtain seed of it there met with no success. It is common along the Southern Pacific railroad near Castroville, California, on the main line to Salinas, where it flowered profusely during the season of my observation; but again my search for seed was not rewarded.

In Utah I have found it well established along the Southern Pacific, out of Ogden three miles, and along the Oregon Short Line, about midway across the valley between Mendon and Logan, Cache county. Along these railroads it certainly appears as if introduced. Last September, however, I at last secured a few seeds, from the locality last mentioned, and think I can say that I obtained not over one seed for each fifty heads of carpels examined—certainly not a very high rate of productivity.

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ATRIPLEX HORTENSIS L. I know of no plant, outside of the grass family, that, with abundance of material in flower and fruit, has given me as much trouble to determine to the genus as has this species. It is well established about Logan, appearing as much like a native weed as an introduced one, and certainly not suggesting an escape from gardens. A tall, slender, erect plant, often six feet high, or more, suggesting a dock (Rumex) more than an Atriplex; and upon my initial notice of it and questioning of others about it, I was informed that it was a dock and supposed to be *Rumex Patientia* L. Upon examination of it, however, I soon saw that it belonged to the Chenopodiaceae; but where? for the two very different kinds of seeds prevented my getting anywhere by using the various published keys to the North American genera. In fact, there are three well defined types of seeds in this plant, but I had observed only the two more conspicuous types then. Later, Messrs. E. H. Favor, H. H. Bartlett, and Aven Nelson, each independently, determined the plant for me.

These three types of seeds in the same plant are well described by G. N. Collins in his paper entitled "Seeds of Commercial Saltbushes," published as Bulletin No. 27, Division of Botany, U. S. Dept. Agric. 1901. However, in order to emphasize these three types further, I will characterize them briefly here. The large seeds are some 4 mm. in diameter, light brown, not convex with rounded edges, but slightly concave with sharp edges, the embryo showing distinctly, vertical between two large, thin, conspicuously veined bracts, 10x15 mm. in size—these the most common and conspicuous. In the type next apt to be noticed, the seeds are black, lenticular, convex on both surfaces, inclosed in a loose or firm transparent pericarp, horizontal, surrounded by the five calyx segments, very much as in certain Chenopodia. In the third type, and the one most apt to be overlooked, the seed is as in the last, less than 2 mm. in diameter, black, with loose pericarp, but vertical, between two small bracts, almost, if not quite, nerveless, not over 4x5 mm. in dimensions—a well defined compromise between the other two types, and certainly worthy of more attention in our text books

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Even in the latest work out, the New Manual of Rocky Mountain Botany, Professor Nelson's diagnosis of the genus *Atriplex* in general, as well as his description of *A. hortensis* in particular, provides for the large and conspicuous type of seed only. The new Gray's Manual, however, probably had this plant in mind when the diagnosis of this genus, as there given, was drawn up. I hope to see this plant more carefully and satisfactorily described in future works that have occasion to mention it.

Utah Agricultural College, Logan, Utah.

SOME NEVADA VIOLETS

By A. A. Heller

The genus *Viola* is represented in both the northern and southern temperate zones, but probably reaches its highest development in America in the regions north of Mexico. It is but sparingly represented in tropical or semitropical places, but the species occurring there are of exceptional interest. As an example: Of the five species found in the Hawaiian Islands, four are shrubs, three of them with flowers of some shade of purple or blue, and one with pure white flowers.

Considering the ornamental character of nearly all the species, it seems strange that so few of them have been introduced into cultivation.

Nevada, with its vast stretches of dry and treeless territory, does not offer a suitable field for the genus, which, as a whole, prefers fairly moist situations. We have in our collection six named species, with a seventh, probably undescribed, sparingly represented. Watson, in King's report, mentions two others, as yet unknown to us. *V. cucullata* is reported from the "Pah-Ute range, Battle Mountains, and Ruby Valley." This, of course, is not *V. cucullata*. *V. canina* is said to occur on the East Humboldt mountains. What present species this may represent, I do not know. In the following account the original descrip-

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tion, whenever available, will be reproduced, together with such facts as have come under my observation.

Flowers two-colored, leaves dissected	V. Beckwithii
Flowers violet-blue, leaves broad, not dissected	V. Austinae
Flowers white, small	V. blanda
Flowers yellow	
Leaf blades broad	
Petioles and blades conspicuously woolly	V. aurea
Petioles and blades puberulent, blades purple veined	V. venosa
Leaf blades lanceolate, tapering to a winged petiole	V. Nuttallii

VIOLA BECKWITHII T. & G. Pac. R. R. Rep. **2**: 119. *pl. 2.* 1855.
Viola montana Kellogg, Proc. Cal. Acad. **1**: 56. 1855.

"VIOLA BECKWITHII, (n. sp.): subcaulescent; ascending stems abbreviated; cauline leaves biternately or pedately parted, decurrent on the margined petiole, the lobes or segments oblong-linear, hirsute-puberulent; stipules minute, scarious, entire; sepals linear, obtuse, ciliolate; lower petal barely saccate at the base, purple, with yellow claws, the upper shorter and deep violet. On the slope of a mountain between Great Salt Lake and the Sierra Nevada; June 1. A well-marked species; with the foliage somewhat like that of V. delphinifolia, *Nutt.*; but the primary divisions compoundly divided in a ternate or pinnatisect manner; and there is a distinct stem, although it is only an inch long in the specimen. Lobes of the leaves half an inch or less in length. Stipules very small and inconspicuous, except those of the lowest and subradical leaves, which are larger. Peduncles 2 inches, naked. Petals half an inch long. Style short, clavate, minutely bearded at the gibbous summit; the stigma lateral."

In the Botany of the King Report, Watson states that the type was "discovered by Beckwith in Agate Pass of the Quartz Mountains, Nevada." I have not been able to definitely locate this place, but it seems to be somewhere in the region of Reese river, and no doubt is in Eureka county. According to the narrative of the expedition it is located about fifty-five miles westward from the East Humboldt or Ruby mountains.

It is one of our early spring flowers, commonly beginning to bloom in March, and is plentiful on the hillsides among sage

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brush, but commonly in shallow ravines or other places where there has been more moisture during the winter It is one of the bird's foot violets, the upper petals deep purple, the lower ones much paler. The dissected leaves are gray with a short pubescence, and are crowded and pressed together close to the ground, forming mat-like masses. This close habit is not well shown in dried specimens, for in nature fully one-half of the plant is beneath the ground, the whole of the stem and about half of the length of the petioles being concealed, while in the dried state it appears as a rather loose and spreading plant.

The Synoptical Flora gives its range as "from N. W. Nevada (Diamond Mountain, *Beckwith*) and adjacent Sierra Nevada, California to Oregon." The Diamond mountains of our present maps are situated in the eastern part of Eureka and the western part of Elko counties, extending north and south for a distance of about 100 miles. The type locality may well be in this range, but it is not "adjacent" to the Sierra Nevada, being at least 300 miles farther east. I have recently seen specimens of this species collected near Salt Lake City, Utah.

VIOLA AUSTINAE Greene, Pittonia **5**: 30. 1902.

"V. AUSTINAE. Related to *V. cognata* of the Rocky Mountains, but the slender rootstocks branching and the plants therefore tufted; both shorter as to stature and leaves and flowers larger; herbage light-green and altogether and unvaryingly glabrous: leaves mostly subreniform-cordate, at time of petaliferous flowering 1 to 2 inches broad, the length rarely 1¼ inches, abruptly tapering to the petiole, obtuse, evenly crenate: peduncles equalling or slightly exceeding the leaves, bibracteolate a little below the middle: sepals lance-oblong and linear-oblong, obtusish; corolla commonly an inch wide, petals blue, spatulate-oblong, obtuse, all nearly equal, the lateral pair only scantily bearded, or apparently sometimes not at all so: fruiting peduncles of the late apetalous flowers erect, shorter than the petioles, their capsules about 5 lines long.

Subalpine in the Californian Sierra, the best specimens of petaliferous plants being from Mrs. Austin, Butterfly Valley,

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Plumas Co., 1876. The late summer state, with capsules from apetalous flowers, known only in a sheet collected by my former pupil, Mr. Milo S. Baker, in Big Valley, Lassen Co., 3 July, 1893. At the time of my proposing the *V. cognata* segregates from *V. cucullata* I placed these Californian and some other Pacific coast forms tentatively under *V. cognata;* but in the light of additional material I see cause to separate them."

Specimens collected in the mountains west of Reno, especially in Hunter creek canyon, seem to belong to this large flowered species. It inhabits wet grassy places along and near streams. The species probably has quite an extended range along the eastern base of the Sierra Nevada.

VIOLA BLANDA Willd. Hort. Berol. *pl. 24.* 1806.

We have a specimen from Slide mountain, Washoe county, collected in July, 1907, by C. L. Brown, which is referred to this species for the present. I had supposed that it would prove to be *V. Macloskeyi* Lloyd, Erythea **3**: 74. 1895, but it does not agree with the description of that species. While having the purple striped petals of *V. blanda*, the base of the leaf is not cordate, as shown in the Illustrated Flora. Future study of this group will probably demonstrate that our plant is undescribed. One should not expect to find *V. blanda* on this side of the continent.

VIOLA AUREA Kellogg, Proc. Cal. Acad. **2**: 185. *f. 54.* 1862.

Viola senecta A. Nelson, Proc. Biol. Soc. Wash. **17**: 92. 1904.

"Stem short, erect, ridged by the decurrent petiole to the leaf below.

Canescent hirsute (but beneath the dense white hairs the hue of the whole plant is yellowish green, more observable on the stems, petioles, veins and peduncles).

Stipules adnate, subscarious, lanceolate acuminate, entire, obscurely nerved.

Leaves ovate, sub-acute; base cucullate, entire, tapering into the petiole and thence decurrent, coarsely sub-repand den-

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tate, three-nerved, triplinerved above; densely canescent hirsute above and below; petioles one to two inches in length, or about twice the length of the lamina, sub-winged, base and stipules encircling the stem.

Figure 7. *Viola aurea* Kellogg (copied from the original).

Peduncles longer than the leaves; bracts opposite, minute.

Sepals ovate, acute, three-nerved, glabrous within; margins ciliate.

Corolla pure brilliant yellow; wings smooth; lower petal simply saccate.

Style capitate, curved, laterally bearded; foramen nearly central.

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Capsule (in embryo state) villous at the apex.

Brought by Mr. C. W. Dorr from Nevada Territory. An alpine species, almost woolly in external appearance."

This, a common violet in western Nevada, at least in the vicinity of Reno, has apparently been collected but rarely, and has been much misunderstood. The referring of it to *V. praemorsa* by Watson, led Professor Nelson to describe it as *V. senecta*, his type coming from near Reno. It is extremely plentiful to the north and west of Reno, appearing on nearly all of the open and treeless hills among the sage brush. With the excellent cover illustration, taken from living plants by Mr. F. L. Peterson, which shows the habit of the plant in nature, the original figure by Kellogg, taken from a dried plant, and the original description, it should be an easy matter hereafter to identify this species. In habit it is much like *V. Beckwithii*, the short stem and lower parts of the petioles being beneath the surface of the ground. The flowers are bright yellow, medium sized, the upper petals somewhat brown tinged on the back. When dry they often turn bluish. Kellogg says that it is an alpine species, but that statement is surely wrong. I have seen it at an elevation of a little over 5500 feet, but it is most abundant between 4500 and 5000 feet. Mr. Dorr probably got the original in the vicinity of Carson or Virginia City. Its exact distribution is not known, but in Pittonia **3:** 41, Greene reports it from as far north as Plumas county, California.

I have found a few individuals of a related plant at Truckee Pass, a short distance east of Reno, but this is perfectly smooth, and has thick, glossy green leaves of more elongated outline. It is probably undescribed, but more and better material is needed.

VIOLA VENOSA (Wats.) Rydb. Mem. N. Y. Bot. Gard. **1:** 262. 1900.

Viola Nuttallii var. *venosa* Wats. Bot. King Rep. 35. 1871.

Viola aurea var. *venosa* Wats. Bot. Cal. **1:** 56. 1876.

Viola praemorsa var. *venosa* Gray, Syn. Fl. **1:** part 1, 200. 1895.

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"Var. VENOSA. A small subalpine form; more or less pubescent; leaves ovate or sometimes rhomboidal, cordate or truncate at base, conspicuously purple-nerved; flowers purplish-yellow, small.—Low, (2-3 inches high,) showing the same tendency to the elongation of a single pedicel from each stem. It much resembles *V. pedunculata*, but the flowers are only a third as large. Frequent in the mountains from the West Humboldt to the Wahsatch, usually near the snow line; 6-9,000 feet altitude; May-July. (145.)"

The above description has not been improved upon, and the plant is apparently not well known, although it is plentiful on the Sierra Nevada in the Donner Lake region and northward. It has been confused with *V. purpurea* Kellogg, a species whose natural habitat is in the Coast Range of California, and which, in typical form, resembles this species but little. We have two specimens from Nevada that seem to belong here. One is my 9253, collected on the Clover mountains back of Deeth, Elko county, elevation 9000 feet, in the extreme eastern part of the state, while the other is from the extreme western part, from Franktown creek, Washoe county, elevation not given, but presumably near 8000 feet. It was collected in July, 1907, by Mr. C. L. Brown. Watson's statement that this species "much resembles *V. pedunculata*" except for the smaller flowers, is altogether misleading, for there is no likeness whatever. *V. venosa* is a small alpine or subalpine species, dull and gray, with purple veined leaves, while *V. pedunculata* is a species of low elevations, confined more especially to the coast region, is often very large, has conspicuously leafy stems, bright green foliage, and large golden-yellow flowers.

VIOLA NUTTALLII Pursh, Fl. Am. Sept. **1**: 174. 1814.

At present we have no specimens in our herbarium from Nevada that may with certainty be referred to this species. Watson, in the Botany of the King Report, cites specimens from the East Humboldt mountains, and my 9252 from that range is labeled as such, but should perhaps rather be referred to *V. venosa*. The leaves are rather strongly purple veined, but most

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of them lanceolate, although a few of them, even on the same plant, conform in shape to those of *V. venosa*, and the plants have the same pale color. It was found in company with 9253 referred to above under *V. venosa*, growing below a snow bank, and bore fruit only, while the other was in full flower.

In Pittonia **3:** 38, Dr. Greene states that *V. Nuttallii* belongs strictly to the Rocky mountain region. This may very well be true, for most violets have a rather limited distribution.

COLORADO NOTES

By George E. Osterhout

Aulospermum Betheli sp. nov.

Leaves and peduncles arising from a strong perennial root, this often clothed at top by old leaf sheaths: the scape leafless, remarkably stout, purplish at base, 6 to 15 cm. long, exceeding the leaves: the leaves from broad, clasping, scarious sheaths, the petiole more slender than the peduncle, 3 cm. or more in length, the blade broadly ovate in outline, ternate and bipinnate, the rachis of the leaflets winged, the leaflets rather broad, coarsely toothed and the teeth sharp pointed: rays of the umbel 2 to 4 cm. long, the fruiting pedicels 5 to 8 mm. long: involucre none: involucels of several linear, acuminate bracts: flowers purple(?): fruit 7 to 8 mm. long, 6 to 7mm. wide, with three to five broad wings not thickened at the base: oil tubes 4 on the comissure, 3 to 5 in the intervals: seeds somewhat flattened dorsally, with a broad concavity.

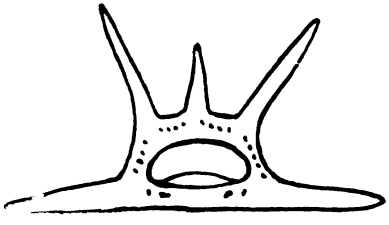

Figure 8. *A. Betheli* x 5 diameters

This species somewhat resembles *Aulospermum purpureum* (Wats.) C. & R., and I suppose is nearest to it, but seems to be somewhat stouter, and has four oil tubes on the comissure instead of eight. Collected at DeBeque, Mesa county, Colorado,

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June 29, 1909; and I take pleasure in naming it for its discoverer, the able teacher and enthusiastic collector, Professor Elsworth Bethel, of the East Denver High School.

ASTER LAEVIS **strictiflora** var. nov.

Strict and upright, 8 to 12 dm. high, all the leaves narrowly linear, the lower about 12 cm. long, 6 to 8 mm. wide, the blade only slightly differing from the winged petiole, and sessile by a broad but scarcely clasping base, the upper similar but smaller and with more clasping bases: the inflorescence slightly panicled, the branches upright and strict: the flower heads 6 to 7 mm. high: the coriaceous bracts green for half their length.

Differing from *Aster laevis* L. in the narrow, linear leaves and the greener bracts of the flower heads. Collected at Glenwood Springs, Garfield county, Colorado, August 18, 1906, no. 3397.

ARNICA PARRYI **crinita** var. nov.

About 3 dm. high, soft pubescent below, strongly glandular pubescent above: the lowest leaves narrowly ovate; narrowed at base, softly pubescent, denticulate, usually two pairs of linear leaves on the stem: the heads on peduncles 5 to 10 cm. long, with well developed rays: achenes pubescent.

Similar in leaf and stem to *Arnica Parryi* A. Gray, the pubescence notably glandular above, and the achenes seemingly more pubescent, but differing mainly by the well developed rays of the flowering heads. Collected on Mt. Cameron, Larimer county, Colorado, altitude about 12000 feet, August 15, 1908, no. 3814.

New Windsor, Colorado.

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Entered as second-class matter November 24, 1908, at the post office at Reno, Nevada, under the Act of Congress of March 3, 1879.

ANNOUNCEMENT

A new edition of the Catalog of North American Plants is in preparation. Thus far 100 pages have been printed, and other parts will follow as fast as possible. In all there will be about 300 pages. Since a considerable time must elapse before the work can be completed, the 100 pages and other parts as soon as issued, will be sent to those who wish to have them in that form, for $1.25, payment to be sent with the order.

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MAY, 1910

Editors: A. A. HELLER and P. BEVERIDGE KENNEDY

Sphaerostigma nevadense (Kellogg) Heller

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University of Nevada,
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Volume 6 June 30, 1910

MUHLENBERGIA

NOTES ON THE FLORA OF NEVADA—I

By A. A. Heller

It was my intention originally to make this particular paper the second in the series on the species, especially the Nevada ones, described by Dr. Kellogg. But Kellogg's species concerning which I wish to write have been so universally misunderstood as well as misrepresented, that it seems best to take them one at a time and reproduce his original figures, or illustrate them anew from fresh material, or give both, as was done in the case of *Viola aurea*.

Eriogonum maculatum Heller, Muhlenbergia **2**: 188. 1906.

No. 8644, collected June 28, 1907, at Truckee Pass, Washoe county, some six or seven miles east of Reno, where the Truckee river enters the gorge it has cut through the Virginia mountains. The plant is fairly plentiful in that region and has also been collected near Reno, as well as farther east, about Wadsworth. It ranges over a wide extent of territory, the type having been collected in Owen's valley, California. We have a specimen from Goldfield, and one from Moapa, in the southeastern part of the state, in Clark county. According to specimens in our herbarium, *Eriogonum angulosum* vars. *patens and flabellatum* Gandoger, Bull. Soc. Roy. Bot. Belg. **42**: 187. 1906, are forms of this species, and no doubt var. *pauciflorum* is the same, for nothing else in the vicinity of Reno, excepting perhaps *E. pusillum*, could be confused with this species. These varieties merely represent individual variations, principally due to difference in age of the specimens, and are not worthy of names. The statement that the flowers are white in two of them is no doubt an error. The flowers of the specimens in the

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herbarium are old and discolored, but all show the dark line or blotch on the perianth segments characteristic of this species, and in living plants the yellow is much darker in some than in others.

ESCHSCHOLTZIA MINUTIFLORA Wats. Proc. Am. Acad. **11:** 122. 1876.

Watson originally described this as having "seeds nearly smooth, scarcely half a line broad." He cites no particular locality, but refers to the botany of the King Report where the plant is listed as "found on the dry foot-hills of the Virginia and Trinity Mountains, Western Nevada." Greene, in Pittonia **5:** 280, under his description of *E. minutiflora*, says: "The above diagnosis is from material of Mr. Watson's own collecting at Truckee Pass, May, 1868, and the label bears this number 51." Truckee Pass, therefore, is the type locality. My no. 8651, collected at Truckee Pass, June 28, 1907, shows that Watson was only partially correct in his description of the seeds. On one and the same plant may be found immature seeds, olive-green in color, which are "nearly smooth," while perfectly mature seeds are almost black, strongly pitted. Watson evidently had only immature seeds.

CLEOMELLA HILLMANI A. Nelson, Proc. Biol. Soc. Wash. **18:** 171. 1905.

Cleomella longipes var. (?) *grandiflora* Wats. Bot. King Rep. 34. 1871.

Nelson describes this as having "seeds subspherical, 2-3mm. long, straw-colored, smooth," and says "I would pronounce this Dr. Watson's *C. longipes grandiflora* if he had not said that the seeds of that were dark colored and rugose or pitted." Professor Nelson was led astray by putting too great reliance upon seed characters. Here too, as in *Eschscholtzia minutiflora*, one may find two apparently distinct seeds on the same plant. Dr. Kennedy first called my attention to this fact, and on July 6, 1909, I collected a quantity of seed on University Heights, Reno, the type locality. Nearly every plant had "straw-colored smooth" seeds, as well as "dark colored, with the surface more

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or less rugose or irregularly pitted." The light ones are somewhat more plentiful, but both colors are well represented.

Sphaerostigma nevadense (Kellogg)

Oenothera Nevadensis Kellogg, Proc. Cal. Acad. **2**: 227. *f.* 70. 1862.

Sphaerostigma tortuosa A. Nelson, Proc. Biol. Soc. Wash. **17**: 95. 1904.

Oenothera gauraeflora var. *vermiculata* Jones, Cont. West. Bot. **12**: 16. 1908.

(With cover illustration)

"Oenothera Nevadensis.—(Kellogg.) Fig. 70.

Stem robust, sub-decumbent, six to eight inches high, glabrous below, minutely strigulose pubescent above, strongly decurrent angled.

Lower leaves oblong-lanceolate, irregularly and also coarsely erose-repand-dentate, petioles short, sub-winged and expanding at the base, sparingly strigulose throughout, veiny, upper bractoid leaves lance-linear, corneously acute, on very slender petioles, about the same length as the lamina, or three or four times the length of the ovary; slightly scabrulose and minutely strigulose throughout.

Flowers small, white, in a dense, obtuse terminal leafy spike, neither circinate nor drooping. Calyx tube linear-funnelform, somewhat ridged, scarcely shorter than the ovary, segments carinate, (or from a closely reflexed base erect beyond the middle) as long as the tube; petals ovate or obovate on a short claw; stamens somewhat unequal, mostly slightly exsert; anthers oblong, fixed by the middle, versatile; stigma sub-capitate scarcely a little longer.

Capsules sessile, subulate tapering from a broad base, quadrangularly or strongly four-ridged, valves one-nerved, scabrulose and strigose puberulent, arcuately tortuose; seeds oblong ascending.

This plant belongs to the subdivision *Sphaerostigma*, and is closely allied to *Oenothera gauraeflora;* but that has linear-lanceolate veinless leaves, and yellow flowers; the bracts, also,

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are shorter than the ovary and linear or subulate. The ovary, also, is said to be glabrous.

We have not seen the base of the stem; the leaf only accompanying the spike, as exhibited in the figure."

The above is the original description by Kellogg, and the synonymy gives a partial history of the plant. Watson, in Proc. Am. Acad. **8**: 608. 1873, lists it as a synonym of *Oenothera gauraeflora*, but evidently had seen no material of it, for none of the collectors cited by him had obtained plants in western Nevada. To Watson, then, apparently should be given the credit of reducing the species to synonymy without sufficient evidence. So the matter rested until 1885, when Mrs. Curran, Bull. Cal. Acad. **1**: 137, has this to say about it:

"OE. NEVADENSIS, Kellogg, l. c. ii. 227. fig. 70. The large leaf accompanying the figure does not belong to it.

Re-collected last year on rocky hills near Reno, Nevada. Quite distinct from *Oe. gauraeflora* to which it has been referred."

This is the second recorded collection of the species, for Watson does not mention it in the botany of the King Report. In 1904 it was published as *Sphaerostigma tortuosa* by Nelson, the type collected by Kennedy at Truckee Pass. In 1908, Jones, overlooking Mrs. Curran's note, and Nelson's recent publication, described it as *Oenothera gauraeflora* var. *vermiculata*, and his term "prostrate," exactly describes its habit. Of the three who have given names to the plant, he is the only one that saw it growing. Kellogg must have had some information from the collector about its habit, for he says it is "sub-decumbent." His specimen was fragmentary, not even showing the root. Furthermore, the large detached leaf shown in the original figure differs so much from the others, that it very evidently belongs to some other plant, and the part of the description referring to it should be discarded.

Our cover illustration, taken from a plant collected on University Heights, Reno, early in June, 1909, shows exactly the habit of the plant, the branches lying flat upon the ground, the ends only slightly ascending.

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RECENT LITERATURE

LANDMARKS OF BOTANICAL HISTORY: A Study of Certain Epochs in the Development of the Science of Botany. Part I.—Prior to 1562 A. D. By Edward Lee Greene. Washington. Published by the Smithsonian Institution. 1909.

Dr. Greene does not undertake, in the present treatise, a formal history of botany. Rather he desires to give an account of certain early botanists who, as is suggested by the felicitous title of his work, loom up like headlands, as one navigates the misty seas of prelinnean science. And for such a voyage there could be desired no better pilot. His predilection for the early botanists is well known. To do justice to them he has heretofore adopted the unconventional expedient of supplanting familiar generic names by their long disused ones. In the present work he honors them in a better way, by recounting their labors in laying the foundations of botanical science.

In a preliminary chapter he considers the character of the science, distinguishing between the philosophic side, which is concerned with the nature and relationships of plants, and its utilitarian aspect, which regards their uses. It was from this side that it was approached by its early cultivators. The author urges that long before the first book on plants was written, there existed a crude recognition of the interrelationship of plants, a designation of their superficial parts, and a vernacular nomenclature.

It is not within the period here embraced that botanists ceased to be primarily herbalists and ruralists. Plants, therefor, were grouped on resemblances of root, stem and leaf. In time some weight was given to fruit character, and toward the end of the period under consideration the importance of the flower came to be dimly perceived. But it was not until the day of Cesalpino that there came the appeal to anthology and carpology as the authentic bases of taxonomy.

Organography was thus the foundation of botany, rudely laid in a past beyond the possibility of measuring. "It did not

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begin with the first books of botany, nor with the men who indited them." Our author holds it to be "the essence and substance of botany proper," and that along the line of the development of organography and its terminology alone can "a coherent and philosophical history of botany" be written.

He begins, then, with a short account of the Rhizotomi, the Root-gatherers of ancient Greece, who have their representatives, equally unentitled to be recognized as botanists, in the diggers of "Sang," and other "cullers of simp'es," in the mountains of our own land. Yet it was probably to their influence that he ascribes the undue attention that writers, even up to the eighteenth century, devoted to the description and figuring of the roots of plants.

It is with Theophrastus, the long acknowledged "Father of Botany," that its authentic history begins. He was born at Eresus, on the island of Lesbos, 376 years before the Christian era, and lived to be more than a centenarian. While yet a youth he studied under Plato, and later became the pupil and friend of Aristotle, and eventually his literary executor and his successor in the Lyceum. The day of the specialist was centuries below the horizon, and the Eresian, like his master the Stagerite, was a philosopher, a professor of the whole round of knowledge, and a botanist only as botany was a part of that round. He traveled little, and the most of his knowledge of plants seems to have been acquired by his studies in what may be called the earliest of botanical gardens wherein he taught. He was an acute observer, and attained to a remarkable knowledge of plant life, while his illuminating and constructive mind deduced therefrom principles that remain among the fundamentals of the science. In contrast with our positive diagnoses, he described plants by comparison, one unknown being likened to another that was familiar. Thus, where we would define a leaf as lanceolate, he would state that it was like that of a willow. This method was universally followed for many centuries, and traces of it yet remain in our present nomenclature, when we confer such specific names as *salicifolia*, or the like.

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"The Greeks and Romans after Theophrastus," whose works incidentally touched upon plants in one way or another, were writers on rural topics, as Virgil and Columella; on medicine, as the industrious Dioscorides and the traveled Galen, or that first encyclopedist, the compiler, Pliny the elder. Great as were the productions of these authors, and long as they held their places of authority in the schools, botany received little or no advancement at their hands.

Now comes the decline of decaying Rome, and until the revival of learning in the fifteenth century, botanical knowledge, if botanical knowledge there were, is hidden in the murky darkness that broods over the earth. Priceless parchments of ancient learning are erased to afford a fair page for the engrossment of monastic fables. Perchance even yet Aristotle's lost treatise may exist beneath the miraculous legend of a saint. For thirteen troublous centuries no single Landmark emerges from the gloom.

Light dawns in Germany. Men shake off their torpor and their dreams, and awaken to a new intellectual activity. A group of botanists appear, and it is noteworthy that all are Lutherans, and all are physicians. The first of these "German Fathers" of the revived science was Otto Brunsfels, of Mayence. In 1530 he brought out his *Herbarium Vivae Icones*, "to give," as he wrote, "a prop to fallen botany, to bring back to life a science almost extinct." He was a Carthusian monk, who left his monastery to devote himself to the support of the Reformation, and he became a schoolmaster, later a physician, and the voluminous author of long-forgotten books of theology and of medicine. To botany his only contribution were the *Icones*, folios of good plant pictures, accompanied with a text compiled from previous authors. His book, like those of his cotemporaries, was designed to facilitate the identification of the many plants of reported remideal virtues, which were the principal medicines of the period.

The great success of the *Icones* incited Leonhard Fusch to undertake a similar work on a more extensive scale. Born at Memmingen, in Bavaria, in 1501, he received the best educa-

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tion the German schools could bestow, and became a celebrated physician, and a popular university lecturer on medicine. His interest in botany appears to have been connected with these professional pursuits. He employed two painters and the best engraver in Strassburg, and by their assistance published a great volume entitled *Historia Stirpium*, containing 512 large plates, whereas Fusch had figured but 135 plants. The text has little that is original, but in the "Explanation of Difficult Terms" we have the first botanical vocabulary. In it appear such familiar terms as "scape," "decussate," and "verticillate," as applied to leaves, and "calyx," which he defines as a "bag within which first the flower, and after that the seeds, are enclosed."

Perhaps Brunfels rendered his greatest service to botany when he visited Jerome Bock at Hornbeck, and encouraged him to publish the results of his botanical studies. Bock is better known under the name of Tragus, but of his life few particulars have reached us. He was born near Heidelberg, in 1498, and became a preacher and a distinguished physician. With him botany was a real love of plants for themselves, and not for their utilities. The others wrote in Latin, he in German; they copied the classic accounts to accompany their pictures, he studied and knew plants, and described them himself, and as he had no aid from figures, his descriptions must needs be as accurate as he could make them. His "Kneues Krauterbuch" was, therefor, more original than the fine picture books of the others. He follows the established system of phytography, whereby plants were grouped solely on vegetative characters, a method productive of what are to us very incongruous assemblages. But he investigates the neglected flower, and recognizes seven forms of the corolla; he sees that stamens have two parts, the "capillamentum" and the "apex;" he counts them, and finds that their number is definite, but different in different species of plants. They are not a mere vague "tuft of hairs," as others had called them. He even had some notion of what he was the first to call the "pistil." These were wonderful advances in anthology, only he did not in the least realize their importance, and had no remotest inkling of the significance of these organs. He

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was an experimenter, too; as with willows. "Whether this wool of willows be their seed or not I do not know," he writes, "except as regards the fourth species, in the case of which it at least takes the place of seeds; for in this I have caught the floating wool, have sown it, and have seen willows of this same species spring up from the sowing." But he was disposed to think that willows usually originated from mud, for he was a firm believer in abiogenesis, and held that many plants were generated by lifeless matter.

Next in this group of German medical botanists come Euricius and Valerius Cordus, father and son. The contribution to botanical literature of the elder Cordus was a colloquy entitled *Botanicologicon*, in which he exposed, and in part corrected, the wrong identifications which were current of the plants described by the classical authorities.

The son was a young man of brilliant and original genius, with an insight into plant organography far superior to that of any botanist up to his time. His discoveries were many and important, and he seems to have been on the road which would have led him to others of still greater significance. He died at Rome, when but 29 years of age, and his *Historia Plantarum* was not published until 1561, seventeen years after his death. In it he described some 500 species, anew and direct from nature, and after a definite and methodical plan. In organography he made great advancements, distinguishing the corymb from the umbel, defining the bract and the involucre, and establishing the character of the calyx, which no longer need be a "bag" or a "cup," but an organ of any figure situated beneath the "flower," as the corolla was then called—a dependence upon position in place of form. He conceived the term "papilionaceous" to designate the "flowers borne by all leguminous plants." He seems, indeed, instinctively to feel the importance of the flower, and studies it with greater care and comprehension than any of his predecessors. He notices the "dust" shed by the anthers, and calls it "pollen," of course not at all understanding its nature; but he knew that ferns were "propagated by the powder produced on the back of the leaf, and blown away by

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the wind." He discovered the flowers of the fig, always before asserted to be flowerless. The ovary he would no longer term a "fruit," but denominates a "tubercle," and so a part of the flower, a distinction of revolutionary import. These and other momentous discoveries were the achievements of a life cut off in its early prime. To what might he not have attained had it been prolonged to its full term!

Thus has our author brought us to the middle of the sixteenth century. We apprehend that few are so versed in the early history of our science as not to find in his interesting and instructive pages something new, at least in the interpretation of the past. The most will there obtain clear and definite ideas of men and their works whereof their knowledge has been slight and vague. He leaves us on the eve of a period of intense interest, of brilliant developments and of master minds. He has so sympathetically elucidated the remotest past that we await with high anticipation his account of the Landmarks just in sight.—S. B. PARISH.

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TWO COLORADO UMBELLIFERA

By George E. Osterhout

Phellopterus macrocarpus sp. nov.

Perennial from a large tuberous root, somewhat caulescent, the stem crowning at the surface of the ground, from which spring the leaves and the flowering stems: the leaves with broad scarious bases, 1 dm. or less long, linear in outline, glaucous, bipinnate: stems several, scapose or usually dividing into a cluster of leaves and the stem, which blossoms near the ground but elongates till it equals the leaves: the flowers purple, the rays of the umbel few, 8 to 15 mm. long at maturity: the involucre small and scarious, usually divided, the involucels about equaling the flowers, of separate bracts, the middle green, the margin white and scarious: the fruit orbicular or somewhat longer than broad, 10 to 14 mm. long, the wings thin and enlarged at the base: oil tubes usually 6 on the commissure and 3 to 5 in the intervals.

This *Phellopterus* is closely related to *P. montanus*, and some may consider it only a variety of that; but it is somewhat larger, with longer fruiting stems, purple flowers, and larger fruit. Collected in fruit June 16, 1908, about four miles east of Las Animas, Bent county, Colorado, no. 3906. Mr. T. B. Osterhout, of Las Animas, sent me flowering specimens of this and the following species in April, 1910.

Cymopterus lucidus sp. nov.

Perennial from a large tuberous root, acaulescent, the leaves and flowering scapes from a slender stalk, the leaves narrow in outline, glabrous, light green, 6 cm. or less long, pinnate, of one to two pairs of leaflets, the terminal leaflet largest, the leaflets lobed: peduncles several, about the length of the leaves: the flowers white, in close heads: the rays of the umbel short, about

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5 mm. long: involucre none: involucels of several linear pointed bracts united at base: the fruit 7 to 10 mm. long by 6 to 8 mm. wide; the carpels with 3 or 4 unusually broad wings which are moderately thickened at the outer portion: oil tubes small and numerous, 8 to 10 on the commissure, 5 to 7 in the lateral intervals, 8 to 12 in the dorsal interval, or if 3 wings, 8 to 12 in all the intervals.

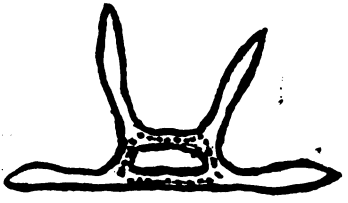

Figure 9. *C. lucidus* x 5 diameters

While the flowers of this *Cymopterus* are white, in this respect resembling *C. acaulis*, the leaves have a closer likeness to *C. Fendleri*. The longer and differently lobed leaflets separate it from *C. Parryi* Collected in good fruit about four miles west of Las Animas, Bent county, Colorado, June 16, 1909, no. 3905. The flowers appear early in April.

When I published *Aulospermum Betheli* on page 46 of this volume, the color of the flowers could not be determined from the material at hand, and I wrotr "flowers purple (?)". I collected it on May 26, 1910, at the type locality, DeBeque, Colorado, and found the flowess to be greenish-yellow. It was an unfavorable season for early flowering plants, having been warm and very dry, and I was able to get but little material of it—two or three fruiting specimens and a single plant in flower.

New Windsor, Colorado.

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A. A. Heller,

539 West 5th street, Reno, Nevada

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Aug 31 1910

Volume 6 Number 6

MUHLENBERGIA

JUNE, 1910

Editors: A. A. HELLER and P. BEVERIDGE KENNEDY

Lupinus lacteus Kellogg

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University of Nevada,
Reno, Nevada

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Volume 6 August 26, 1910

MUHLENBERGIA

NOTES FROM NORTHERN UTAH—II

By C. P. Smith

Amongst my collections of 1909 are some introduced plants which perhaps are worthy of record, since I am unable to find any report of their occurrence in North America, at least escaped from cultivation.

Galega officinalis L. This plant is a native of southern Europe, and may be sometimes cultivated in this country, since it, and the other species of the genus, as now limited, are described in Bailey's Encyclopedia of American Horticulture, tho they are not mentioned in Gray's Field, Forest and Garden Botany. None of our text books mention them, and I was unable to determine my collection.

Its nearest affinities are probably with the genus *Cracca*, since Linnaeus, in the second edition of his work, referred his species of *Cracca* to the genus *Galega*. *G. officinalis* is a perennial, and is certainly well established in an alfalfa field, and along a roadside nearby, in the Greenville district, near Logan. Determined by M. L. Fernald.

My only collection of it thus far is: No. *2018*, Cache county, Logan, 14 August, 1909.

Veronica campylopoda Boiss. Common in an alfalfa field on the Utah Agricultural College farm. A native of Syria, northern Persia, etc., this plant has evidently been introduced here with alfalfa or other crop seeds; but I have been unable to learn just how or when it made its appearance. Its nearest ally, at least so far as our forms are concerned, is *V. Tournefortii* C. C. Gmel. (*V. Buxbaumii* Tenore; *V. byzantina* B. S. P.), to

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which I naturally traced it, using the keys in the old Coulter's Manual and in Britton and Brown's Flora. Not satisfied, however, with calling it such, I finally submitted it to Dr. B. L. Robinson, to whom I am indebted for the correct determination. As it may be established elsewhere and generally taken to be *V. Tournefortii*, I offer the accompanying drawings to point out the main difference between the two species. All are drawn to

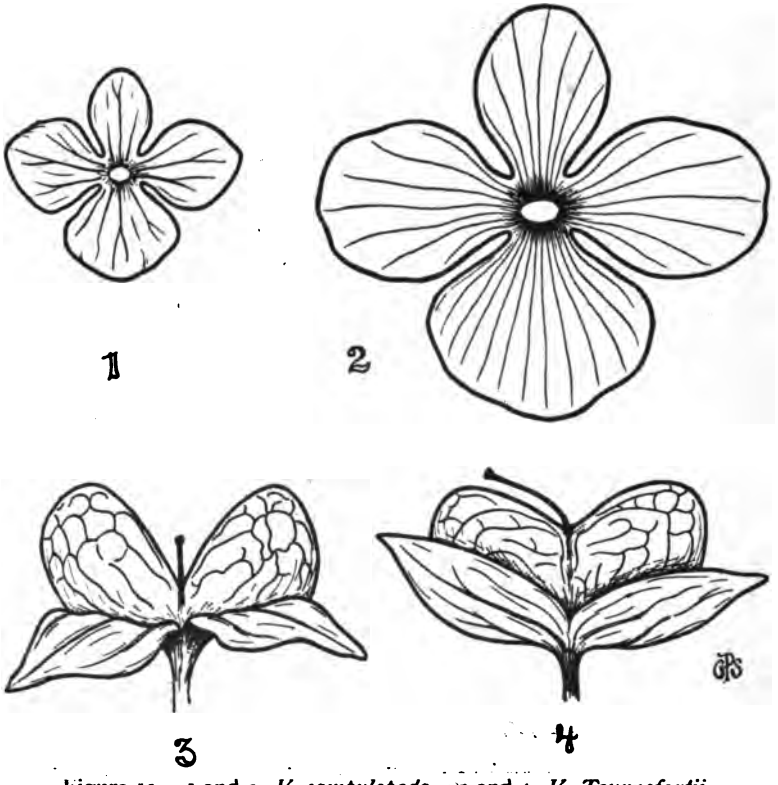

Figure 10. 1 and 3. *V. campylopoda*. 2 and 4. *V. Tournefortii*.

the same scale, and are considerably enlarged. Those of *V. Tournefortii* are from material taken near Cambridge, Mass., and kindly sent to me by Professor Fernald. I have since found this species also here in Logan, and should say that in the plants here the corollas are considerably smaller than in the Cambridge specimens, tho the fruits are of practically the same measurements.

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My collections of *V. campylopoda* are: No. *1604*, Cache county, Logan, 4 June, 1909; no. *2167*, Cache county, Logan, 2 June, 1910.

MALCOMIA AFRICANA (Willd.) R. Br. Another native of the Mediterranean region, determined for me by Professor Fernald. This strange mustard was found on a railroad "fill" in Provo canyon, a short distance below the station known as Falls. The plants were very much flattened out when in packed soil between the ties; but those on the embankment slopes had the main stem erect and some of the branches ascending. The four sided siliques suggested, to me, the genus *Erysimum;* but the small purple petals indicated other affinities, and as all environmental evidences pointed to its being an introduced plant, I sought the help of others for its determination.

Tho I walked some thirteen miles along the railroad in Provo canyon that trip, and noticed it nowhere except on one certain embankment or fill, I have no doubt that it may be found elsewhere about Provo and in the state. My collection is: No. *1923*, Utah county, Provo canyon, 23 July, 1909.

BROMUS JAPONICUS Thunb. Taken by Mr. A. O. Garrett and myself, along Red Butte creek, near Salt Lake City, both in the canyon and out on the bench at the base of the mountains, being seen nowhere else. Determined by A. S. Hitchcock. No. *1829*, Salt Lake county, 16 July, 1909; no. *1910*, Salt Lake county, 21 July, 1909.

Utah Agricultural College, Logan, Utah.

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COLORADO IN THE NEW ROCKY MOUNTAIN BOTANY

By George E. Osterhout

Dr. John M. Coulter's "Manual of the Botany of the Rocky Mountain Region" was published in 1885, and the "New Manual of Botany of the Central Rocky Mountains," which is Dr. Coulter's Manual revised by Dr. Aven Nelson, was issued early in 1910. Dr. Coulter has had a deep interest in this revision, as Dr. Nelson tells us in the preface: "The work has gone through the press under his direct supervision, and all the proof sheets have passed through his hands." Dr. Coulter, too, contributed the main preface which defines the territory covered, and states the aim and scope of the book. To Dr. Nelson, however, the real work of the revision fell. "Professor Nelson has completely rewritten the book, and in such a way that it is as far from being a compilation as so general a manual can be. He has checked up the descriptions by an examination of the plants and by his extensive field experience. Descriptions and keys have been tested repeatedly, and are believed to be workable."

The territory embraced is not exactly that of Coulter's Manual, though the difference is not great. "The purpose has been to use Colorado as the center of the flora included in the manual, and to present complete the flora of that state, of Wyoming, of Yellowstone Park, and of the Black Hills of South Dakota; also to include most of Montana, southern Idaho, the eastern half of Utah, and the northern half of New Mexico, and adjacent Arizona."

No statement of territory to the east of Colorado is made, but if Colorado is the center of the territory, there must of necessity be some of western Nebraska and Kansas included; and when we read of a plant "extending into the eastern part of our range," or "extending into our range from the eastern United States," we would not know from this statement that the plant under consideration belongs to the Colorado flora.

Colorado then being the center of this territory, we should expect to find in it a richer flora than in the surrounding terri-

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tory. Extending for some distance from the mountains eastward, most of the plants of that part of Nebraska and Kansas which is included in the Manual are found on the plains of eastern Colorado. Its long range of lofty mountains contain about all the alpine flora which is found in the adjoining states. Most of the plants of northern New Mexico probably reach its southern border; and not many of the peculiar desert plants are found in eastern Utah which are not also found in western Colorado. Some plants of the Uinta and Wasatch mountains are not found in Colorado, and there are quite a number in the north and northwestern part of the territory which do not reach Colorado. I suppose the larger part of these plants which are described in the Manual and not found in Colorado are of this section. Several species of *Carex* and *Salix*, some species of *Astragalus* and *Aragallns*, the genera *Comarum*, *Fatsia*, *Bupleurum*, *Oreastrum*, *Ionactis*, and *Tanacetum*, may be mentioned as examples.

Judging from the range as given in the descriptions of species, one can not be quite sure how many of the listed plants are found in Colorado. Many are said to occur in Colorado, many are said to occur "throughout our range," some are said to be found from "Texas to Montana," and some "range across the continent." Counting those which are said to occur in Colorado or are in territory in which Colorado is included, I listed 2169 species and varieties. Since 2919 species and varieties are described, this would leave 750 which are found in the surrounding territory and not in Colorado. However, quite a number of plants are found in Colorado which are not so indicated. In a hasty examination I noticed the following which do not seem to be included in the Colorado flora:

Carex Reynoldsii Dewey; *Heteranthera limosa* (Sw.) Willd.; *Allium sibiricum* L.; *Fritillaria atropurpurea* Nutt.; *Lewisia rediviva* Pursh; *Ceratophyllum demersum* L.; *Amorpha fruticosa* L.; *Amorpha nana* Nutt.; *Polygala alba* Nutt.; *Asclepias incarnata* L.; *Pentstemon Fremontii* T. & G.; *Gilia pharnaceoides* Benth.; *Stenophragma virgata* (Nutt.) Greene; *Horkelia Gordoni* Hook.; *Agastache urticifolia* (Benth.) Rydb.; *Cymopterus Parryi* (C. & R.) Jones; *Lupinus plattensis* Wats.; *Chamaerhodos erecta* (L.) Bunge.

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Marsilia vestita Hook. & Grev., "possibly not within our range," is quite plentiful in damp places on the plains near New Windsor; *Gilia Watsoni* Gray, "Utah and probably in western Colorado and Wyoming," may be found on cliffs at Glenwood Springs. If all the plants which belong to Colorado were so indicated, it is probable that another hundred might be added, making the flora of Colorado, according to the new Manual, 2270 or near that number.

The following have been altogether overlooked: *Fimbristylis castanea* (Michx.) Vahl; *Aristida Humboldtiana* Trin. & Rupr.; *Aristida bromoides* H. B. K.; *Carex magellanica* Lam.; *Allionia Carletoni* Standley; *Cardamine umbellata* Greene; *Argemone squarrosa* Greene; *Cristatella Jamesii* T. & G.; *Portulaca pilosa* L.; *Talinum calycinum* Engelm.; *Helianthemum majus* (L.) B. S. P.; *Acuan illinoensis* (Michx.) Kuntze; *Strophostyles pauciflora* (Benth.) Wats.; *Epilobium palustre* L.; *Euphorbia lata* Engelm.; *Piptocalyx circumscissa* Torr.; *Pteryxia foeniculacea* Nutt.; *Hydrophyllum virginicum* L.; *Asclepias uncialis* Greene; *Cilia rigidula acerosa* Gray; *Engelmannia pinnatifida* T. & G.; *Townsendia lepotes* (Gray) Osterhout; *Machaeranthera coloradensis* (Gray) Greene; *Gaillardia pulchella* Foug.; *Laciniaria squarrosa* (L.) Hill; *Laciniaria spicata* (L.) Kuntze.

There are also some introduced plants which are well established in some localities, such as *Sisymbrium officinale* (L.) Scop., *Sisymbrium altissimum* L., and *Arctium minus* L. These are nearly all of the older and generally accepted species, and only those which have come under my observation. Six of them are in Coulter's Manual. Should one look to the literature of Colorado botany the list could be greatly increased, for while the new Manual credits to Colorado something like 2270 species and varieties, Dr. Rydberg's Flora, published by the Colorado Agricultural College in 1906, lists over 2900 species.

Of the species excluded or reduced to synonymy, the greater number of course are the newer described ones, and while some of them will undoubtedly remain under synonymy, many I think will prove to be good species, and will be restored to a permanent place in our flora. In reducing so many species to synon-

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ymy—in the Compositae there are more synonyms than accepted species—there are many interpretations with which other students will not agree. I suspect, for example, that *Carduus pulcherrimus* Rydb. is not a close ally of *C. Hookerianus eriocephalus* (Gray) A. Nelson, to which it is referred; that *Arnica gracilis* of the new Manual may not be *Arnica gracilis* Rydb., and that *Artemisia coloradensis* is much nearer to *A. ludoviciana* than to *A. Wrightii*, of which it is made a variety.

When a book like this appears, we first look to see if the rare species which we have stumbled upon are included, and whether some of the newly described species have passed muster and taken their place in the ranks of the veterans—or, perhaps, as Professor Nelson would say, whether they have been taken from the ranks of probationers, and admitted to full membership.

While these observations may be considered as kindly criticisms, there are many excellent features in the book—the good descriptions, the keys to the genera and species, the date and place of publication—representing no light labor, which no one will overlook.

Professor Nelson is the honored teacher of biology in the University of Wyoming, one of the men who has grown with the opportunities of the west, and who has made time to do more than his work of teaching.

New Windsor, Colorado.

THE NORTH AMERICAN LUPINES—I

By A. A. Heller

As a preface to this series of papers, it may be well to state that they are offered preparatory to an illustrated monograph of North American species of the genus. This is a task that may not be undertaken lightly. Thus far we have had two revisions ofthe genus, both by men who knew little of the plants in the field. Of the two, Agardh's "Synopsis Generis Lupini," published in 1835, still remains the one to which we must look for

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the most accurate information. It contains an account of the then known species of the world, seventy-six in number, with seven "species inquirendae." Of this number forty-three were from North America north of Mexico.

Watson's "Revision of the extra-tropical North American Species of the Genus Lupinus," was published in Proc. Am. Acad. **8**: 517-548. 1873. He recognized fifty-six species, eleven of which were described by himself in that paper.

During the past decade especially, the number of described species has wonderfully increased, now numbering 230 north of Mexico. A few of these may have to be put into synonymy, but the most of them will undoubtedly survive, notwithstanding the fact that they have for the most part been described by persons who have very little field knowledge of the genus. To those who consider the above statement the wild and unbridled fancy of a "species maker," I would recommend a careful study of that conservative work, Piper's Flora of Washington, wherein five of the twenty-eight recognized species are described as new.

The genus is universally considered a very difficult one, and an intelligible treatment of it an almost hopeless task. This may well be true if the usual methods are pursued, but if intelligently studied in the field, in connection with the herbarium types, and a better system of classification followed, there is no reason why the effort should not be a success.

It was my good fortune to be able to spend six years in active field work in California, which state alone contains nearly half of the known species, and during that time I made it a point to especially study this genus in the field. During the past two years the Nevadan species have been similarly studied, and this spring it was my privilege to spend nearly a month visiting places along the Columbia river, re-collecting species at Douglas' type localities.

In these papers, at least for the present, I shall not attempt to follow any regular order of procedure, but will merely describe new plants as they come to hand, and print notes of interest concerning old species.

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LUPINUS LACTEUS Kellogg, Proc. Cal. Acad. **5**: 37. 1873.

Lupinus arenicola Heller, Muhlenbergia **2**: 75. 1905.

"Stem annual, fistulous, the elongated central peduncle from a mere depressed crown, mostly solitary, spike 4 to 8 inches long, lateral radicle branches 2 to 6 inches long, with secondary clusters of leaves and (when present) shorter spikes, soft pubescent throughout, with white hairs. Leaves mostly clustered at the base, petioles membraneously expanding toward insertion and conspicuously 3-nerved, stipules adnate, subulate; leaflets 6 to 10, ½ to 1 inch in length, or about one-third the petiole, complicate-carinate, arcuate, spatulate, obtuse and slightly retuse, attenuate at base, sparsely appressed pubescent above near the margins, glabrous toward the midrib, silky-pubescent beneath, colored at the point of insertion. Flowers large, white, somewhat distant, verticillate, chiefly by sixes, pedicels short, rather more than half the length of the persistent, subulate bracts; calyx ebracteolate, hirsute, scarious chiefly above, upper lip 2-cleft (rarely entire), about one-third the length of the lower lip, lower lip straight, herbaceous, 2-toothed, about ¼ of an inch long; vexillum glabrous on the back, ciliate at the marginal junction of the claw, face marked by a row of dark oblong spots along each side of the central fold, (rarely a few scattering dots,) banner, wings and keel about equal, wings oblong, obtuse, somewhat spatulate, about equal, margins ciliate at the base or origin of the claw; keel ciliate at the upper inside margin toward the base, acute. Legume very hirsute, 2-seeded.

"In habit and general appearance this species resembles *L. brevicaulis*, but is rather more robust, the flowers much larger and not "deep blue," but quite *white;* besides, the truncate upper lip is a peculiar distinguishing feature of that species—that has bracteoles on calyx, this *none*, etc. It is closely allied to *L. Menziesii*, but the relatively shorter pedicels, and much longer petioles, and both lips lacking the "entire" character and relative proportion, would strongly tend to exclude it; admitting *L. densiflorus* to be the same as *L. Menziesii*, "with variations," it would then bring us a "*dense*, subsessile spike," an *emarginate* upper lip, and *3-toothed lower one*, with which to contend.

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If these and many more varieties prove ultimately to run into one, it is not our fault; as the literature now stands, we are obliged in self-defence, to set it apart, when called upon for determinations. Specimens collected by Mr. S. Brannan, Jr., on Oak Creek hillsides, Kern county, 14 miles from Tejon Pass."

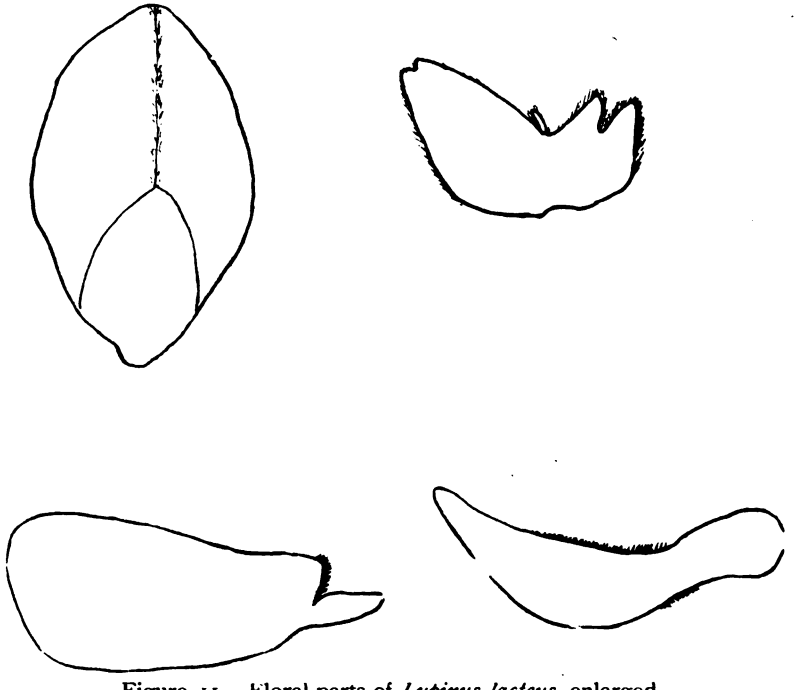

Figure 11. Floral parts of *Lupinus lacteus*, enlarged.

The above is Kellogg's description, and it gives me great pleasure to reinstate this long unrecognized species, even at the expense of one of my own names. The species was barely published before it was suppressed by Watson in Proc. Am. Acad. 8: 542. November, 1873. He there puts it down as a synonym of *L. densiflorus*, but evidently never saw the plant itself, for he does not mention it in the list of specimens examined. During the course of five years he came to another conclusion, for in the Bibliographical Index, published in 1878, it is said to be the same as *L. microcarpus*, a less satisfactory disposition than the first, for it is clearly more related to *L. densiflorus* than it is to the narrow flowered *L. microcarpus*.

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Last winter, while copying the descriptions of Kellogg's lupine species, I saw at once that my *L. arenicola* is the same as *L. lacteus*, and furthermore, they are both from the same region. Although Kellogg's type is no longer in existence, I have no hesitation in referring my *L. arenicola* to this species, and any person who compares the two descriptions can hardly fail to reach the same conclusion. The accompanying figure of the floral parts is taken from my no. 7609, the type of *L. arenicola*. According to my description I failed to see what Kellogg did, that the wings are "ciliate at the base or origin of the claw." But on the contrary, I fail to find that the banner is ciliate at the same place, but do notice a little ciliation on the back of the keel near the base, which is rather remarkable, as indeed is the ciliation on the claw of the wings, a character I have not observed in any other species. As may be observed from the illustration, the type of *L. arenicola* shows a bractlet in the sinus between the calyx lobes, whereas Kellogg says it is not present. Perhaps it was present and he failed to notice it; but this supposition can not now be verified.

LUPINUS KINGII Wats. Proc. Am. Acad. **8**: 534. 1873.
Lupinus Sileri Wats. Proc. Am. Acad. **10**: 345. 1875.
Lupinus capitatus Greene, Pittonia **1**: 171. 1888.

Watson originally described this as having "stems apparently from a perennial subterranean rootstock," basing it upon his no. 234, collected in "Heber Valley in the Wahsatch," which collection was first doubtfully referred in the Botany of the King's Report to *L. aridus*.

Two years later he described *L. Sileri*, an annual Platycarpos, and in 1878, in the Bibliographical Index, refers this latter to *L. Kingii*. I have found no explanation for so referring the plant, but it may perhaps occur in Am. Naturalist **9**: 270, which I have not seen. Correspondents have asked me about these names, but until recently I was as much in doubt as any of them. Miss Eastwood kindly examined the plants for me last winter, and informs me that *L. Kingii* and *L. Sileri* are identical. It seems strange that Watson should have described an

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annual, collected by himself, as a perennial, and then a little later re-described it under another name.

Dr. Greene may be excused for re-publishing this species under the name *L. capitatus*, for there is nothing in either of Watson's prior descriptions to lead one to suspect that this Arizonan plant may be the same. The peculiar glaucescent appearance and the very characteristic broad-sinused upper calyx lobe with the tips of the teeth slightly incurved, are not mentioned, and by inference, at least, it is compared with *L. pusillus*, which it resembles not at all. The species has a wide range in Colorado, Utah, New Mexico, and Arizona.

Lupinus washoensis n. n.

Lupinus pinetorum Heller, Muhlenbergia **6**: 25. *pl. 1. and f. 5.* 1910. Not *L. pinetorum* Jones, Cont. West. Bot. 8: 25. 1898.

A little more care in looking up names, especially in my own Catalog, which was apparently not consulted, would have prevented the making of this unnecessary homonym.

Lupinus Greenei n. n.

Lupinus albicaulis var. *Bridgesii* Wats. Proc. Am. Acad. **8**: 527. 1873.

Lupinus formosus var. *Bridgesii* Greene, Fl. Fran. 42. 1891.

Lupinus Bridgesii Heller, Muhlenbergia **1**: 112. 1905. Not *L. Bridgesii* Gray, Proc. Am. Acad. **8**: 538. 1873.

Although the name *Bridgesii* used in the varietal sense has priority of place over the specific name used in the same paper, present usage demands that a new name be given to this plant, already burdened with synonymy.

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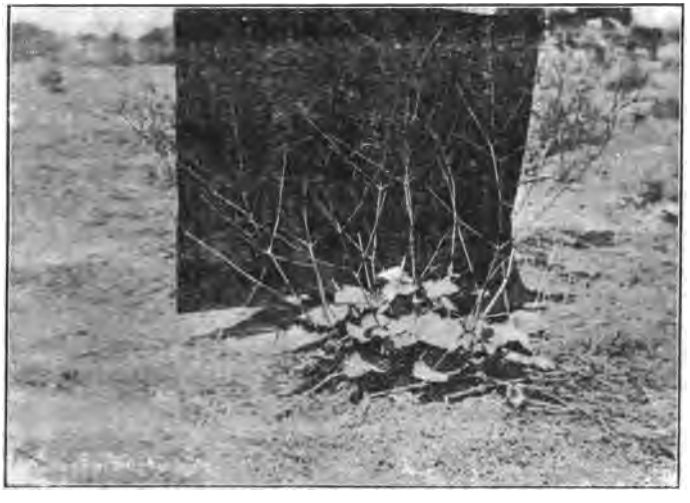

Anulocaulis leiosolenus (Torr.) Standley

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University of Nevada,
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Volume 6 September 30, 1910

MUHLENBERGIA

NOTES ON A COLLECTION OF PLANTS FROM WESTERN NORTH CAROLINA

By Homer Dolliver House

During the past three seasons, the writer has had the privilege of studying close at hand the wonderfully diverse flora of the mountains of western north Carolina. The collections made, amounting to only 500 numbers, were made not with any idea of bringing together a representative herbarium of the region which was so admirably carried out by the Biltmore Herbarium a few years ago, but to collect such plants as appeared to be rare, to represent critical genera, or to record new localities in their distribution.

The specimens of grasses and sedges referred to authorities in these groups have not resulted in the discovery of any species new to the region, although such interesting species as *Carex aestivalis* M. A. Curtis, *C. mirabilis* Dewey, and *Rhynchospora cymosa* Ell. are to be noted.

Among the species new or otherwise interesting are to be noted the following:

Trillium Vaseyi forma **album** forma nova.

Petals pure while, only the pistil and anthers retaining their normal dark purple color.

Pigeon Gap, Haywood county, no. 4146, May 9, 1909.

Typical *Trillium Vaseyi* Harbison, is one of the commonest and most characteristic herbaceous plants of damp cool situations between 2500 and 4000 feet elevation.

Helonias bullata L.

New to North Carolina. Common in sphagnum swamps

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of the Pink Bed Valley, Transylvania county, in thickets of *Kalmia*, *Alnns*, and *Viburnum*. In full bloom April 29, 1909. No. 4117.

Epipactis Willdenovii nom. nov.

Neottia pubescens Willd. Sp. Pl. **4**: 76. 1805.
Satyrium repens Michx. Fl. Bor. Am. **2**: 157. 1803, in part.
Goodyera pubescens R. Br. in Ait. Hort. Kew. ed. 2, **5**: 198. 1813.
Tussaca reticulata Raf. Prec. Decouv. 43. 1814.?
Orchiodes pubescens Kuntze, Rev. Gen. Pl. 675. 1891.
Peramium pubescens MacM. Met. Minn. Val. 172. 1892.
Epipactis pubescens A. A. Eaton, Proc. Biol. Soc. Wash. **21**: 65. 1908. Not *E. pubescens* Pursh, 1814.

Common in damp cool or shady woods, usually under conifers, throughout the lower parts of the mountains, and generally distributed in the eastern states.

DALIBARDA REPENS L.

New to North Carolina. Common in swamps of the Pink Bed Valley, Transylvania county, in thickets of *Kalmia*, *Alnus* and *Viburnum*, usually in sphagnum along with *Helonias bullata*, *Ophrys Smallii* and *Viola pallens*.

CASTILLEJA COCCINEA (L.) Spreng.

New to North Carolina, but reported by Gray's Manual "S. to Va., Tenn. and Tex." First observed by Mrs. House along a roadside, Bradley's creek, Transylvania county, 3500 feet altitude. Later collected by the writer there and on Pisgah Ridge (5000 feet altitude), no. *4162*, 1909. Seen in 1910, in Haywood county, some twenty miles west of the first station.

LONICERA CANADENSIS Marsh.

New to North Carolina. According to the new Gray's Manual "S. to Pa." This discovery marks a rather remarkable extension of range. Collected only once, on the cold northern slopes of a spur of Richland Balsam, at an elevation of about 4500 feet. Growing with *Viburnum alnifolium*, *Acer spicatum*,

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Rubus odoratus, and other northern species which are characteristic of these cold moist northern slopes.

GENTIANA SAPONARIA var. **latidens** var. nov.

Leaves oblong-lanceolate to ovate-lanceolate: the calyx lobes broadly spatulate, acute, shorter than the calyx tube, otherwise resembling the typical species.

This rather curious variety of the soapwort gentian is remarkable for the broad leaves and the broad and short calyx lobes. Collected by Dr. Gray at Balsam, Jackson county, in 1843 (Gray Herbarium). I would indicate as the type of this variety my number 4030 in the Gray Herbarium, collected on wet mossy rocks near the Pink Bed Valley, Transylvania county, September 10, 1908. Growing with *Drosera rotundifolia*, *Limodorum tuberosum*, *Solidago monticola*, etc.

Biltmore, North Carolina.

GETTING ACQUAINTED WITH ANULOCAULIS LEIOSOLENUS

BY P. BEVERIDGE KENNEDY

(With cover illustration)

One is always delighted when in their own territory to come across a distinctive plant unlike anything they have seen before. This was the case with the writer when riding in a buggy, his attention was called, at a distance of some fifty feet, to the stranger that is used as the cover illustration for this issue.

That the plant was unlike anything seen by me either in the herbarium at the University or on any of my field trips, seemed a certainty. Being on other business, and not prepared for the collecting of botanical specimens, the best that could be done was to secure a number of typical scraps of leaf, flower, fruit and stem. Fortunately, one of the party had a small, cheap camera with him, which enabled me to take a picture. We were at the time on a high, dry mesa, strongly impregnated

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with gypsum, about one hundred feet above the Virgin river, and about twelve miles down the river from St. Thomas, Clark county, Nevada, elevation about 1100 feet.

Our suspicions in the field that it must be somewhere near the four o'clock family were substantiated when we returned to our laboratory and literature. Knowing that Mr. Paul C. Standley, of the U. S. National Museum had recently published an excellent review of this family, we first thought we would test his key in Cont. U. S. Nat. Herb. **12:** part 8. The dimensions and character of the plant can readily be obtained from the illustration, and a detailed description of the parts can be gained from the Botany of the Mexican Boundary under the name of *Boerhaavia leioselina.* Both these descriptions should call the leaves leathery rather than fleshy. Standley's key is a little confusing with "flowers large" and "flowers small," and even the dimensions of "2 cm. or less," do not help very much. The flower in bud is fully 2 cm. long, and as the flower develops the tube lengthens greatly, until the whole portion above the receptacle measures 3.5 cm.

The most interesting feature about the whole plant to me, are the regularly placed bands of sticky material half way between the nodes, unlike those of other plants in the desert with glandular excretions. Parry, who according to Torrey in the Botany of the Mexican Boundary, first collected this species in the Great Canyon of the Rio Grande, 70 miles below El Paso, Texas, does not mention these sticky bands. Standley considers that the sticky material is exuded by the plant. When the writer saw the plant in the field, these sticky portions had entrapped a large number of winged ants. The substance is not sweet, and does not dissolve off in cold water. I can not discover any "reddish ring" mentioned by Standley. When the substance is washed off with alcohol, there is left a brown stain. I am not satisfied but that it may be deposited there by insects, perhaps for a trap. Yet it may be to prevent some unfriendly wingless creature from getting up to the flowers and destroying the scheme of fertilization. There are many things in connection with the plants of the desert that need an explanation.

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NOTES ON THE FLORA OF NEVADA—II

By A. A. Heller

Carex

Several numbers of this interesting but difficult genus were collected during 1909 and sent to Mr. Kenneth K. Mackenzie for determination.

Carex capitata L. Sp. Pl. ed. 2, 1379. 1763.

No. 9922, collected July 31, on Mt. Rose, at an elevation of 9650 feet in swampy ground on a northerly slope. Mr. Mackenzie reports that this is "rarely found in the western mountains." The originals were found "in Lapponia, Anglia."

Carex phaeocephala Piper, Cont. U. S. Nat. Herb. **11**: 172. 1906.

No. 9974. An alpine species, collected above timber line on Mt. Rose, September 23d, on stony slopes, at an elevation of 10300 feet, where it is rather plentiful. The type was collected in Oregon by Elihu Hall.

Carex quadrifida Bailey, Proc. Cal. Acad. II. **3**: 104. 1891.

No. 9975, collected at the same place and time as the above, the two growing together. This is evidently a rare species, as it was determined from the description, there being no specimens in New York for comparison. The type is Bolander's 5046, collected on Mt. Dana, California.

Carex scopulorum Holm, Amer. Journ. Sci. IV. **14**: 422. 1902.

No. 9921; collected July 31, on Mt. Rose, elevation 9650 feet, growing with *C. capitata* in swampy ground. The original came from "the region of Clear Creek Canyon," Colorado.

Carex straminiformis Bailey, Mem. Torr. Club **1**: 24. 1889.

No. 9903, collected July 29, on Mt. Rose, at an elevation of 9650 feet, growing in sand in a little flat, at that time rather dry, but which had held snow until early summer.

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Thus far I have collected sixteen species of Carex in Nevada, all of which have been determined by Mr. Mackenzie, the other eleven not mentioned in this paper having been reported upon by him in volume 5 of this journal, pages 53-58.

In addition to the above, two other species, labeled *C. aquatilis* and *C. usta* are in our herbarium, collected in the vicinity of Reno, but I have not had the determinations verified.

In the Botany of the King Report Olney lists twelve additional species and several varieties, bringing the total number of species reported from Nevada up to thirty. The species mentioned by him are: *C. aemathorhyncha*, *aristata*, *frigida*, *leporina*, *Liddoni*, *muricata*, *rigida*, *Rossii*, *Sartwellii*, *scirpoidea*, *utriculata* and *Watsoni*. The latter is described as new, the type collected at the mouth of King's canyon, near Carson. A re-examination of the specimens representing the above twelve names would no doubt result in several changes.

Acrolasia Veatchiana (Kellogg)

Mentzelia Veatchiana Kellogg, Proc. Cal. Acad. **2**: 99. *f. 28.* 1861.

"*Mentzelia Veatchiana* (Kellogg). Fig. 28. The new species of *Mentzelia* herewith presented, figured and described, was recently brought by Mr. Andrew Veatch, from the vicinity of Virginia City, Washoe.

"Stem low, (about a foot) branching from the base, lustrous, light flesh-colored, branches alternate, short villous, root annual.

"Leaves remote, sessile, lower leaves linear-lanceolate, entire, or pinnatifid, dentate above the middle; hispid and scabrous throughout, with minute barbate hairs; the white hairs springing from an indurated corneous base, or submuricate hirsute, the hairs with hooked prickles, in whorls, or sometimes scattered, of diamond-like brilliancy; upper leaves subcordate, coarsely dentate at the expanded base; apex (terminal lobe) long, attenuated and entire (about twice the length of the expanded sub-clasping lower lamina); scabrous margins, and midribs hirsute. (N. B. Upper leaves sometimes lanceolate pinnatifid.)

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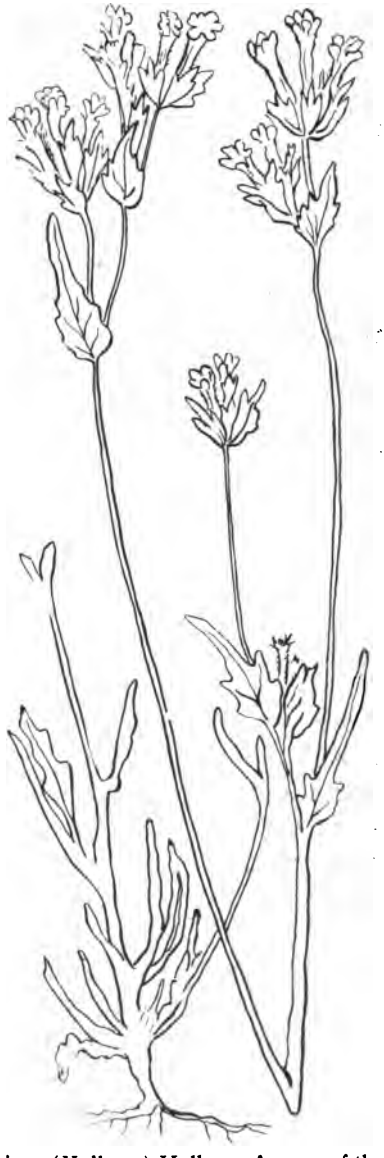
Plate 2



Acrolasia Veatchiana (Kellogg) Heller. A copy of the original figure.

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"Bracts leafy, subpinnatifid, lobed or coarsely (mostly) tridentate, scarcely as long as the capsule. Two other smaller bracteoles opposite at the edge of the capsule, (usually rather more than one-half the length of the capsule) three-lobed or tridentate; the middle lobe a little prolonged, cuneate at base.

"Flowers small, (petals scarcely three lines in length) bright golden yellow deepening to rich orange at the claws or towards the center; petals ovate-oblong unguiculate, five in number, twice the length of the calyx segments, emarginate, apex slightly bristly.

"Stamens and pistils equal, shorter than the petals, about twenty, filaments filiform; pistils connate, apparently simple, included.

"Capsules cylindraceous, slightly narrower towards the base, about half an inch long, hirsute calyx segments, crowning the capsule, subulate one-half the length of the petals; tuberculate scabrous seeds somewhat cubical, in three series, six to eight or more in each row.

"In condensed clusters of two to five (scarcely axillary and solitary) terminating the branches.

"This species seems to be near *M. congesta*, (Nutt. Mss., under Trachyphytum) but the stem is not "dichotomous" nor "polished," nor leaves "short ovate,"nor bracts "membranaceous."

The above is Kellogg's original description, and his figure of the plant is reproduced on another page. Like so many of his species, it was no doubt consigned to oblivion without adequate material upon which to pass judgment, for it has been put down as a synonym of *A. albicaulis*. Kellogg compared it with "*Mentzelia congesta*," and this fact alone should indicate that it could not well be the same as *albicaulis*, for as originally described, that species has flowers without bracts, the obovate, mucronate petals two or three lines long, as long as the calyx. *A. Veatchiana*, on the other hand, has prominent, usually three-lobed bracts, and "ovate-oblong unguiculate" petals "twice the length of the calyx segments."

The species is common about Reno on gravelly hills among the sage brush, and is also found within the city limits.

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THE NORTH AMERICAN LUPINES—II

By A. A. Heller

Lupinus silvicola sp. nov.

Perennial (§ Calcarati): stems clustered, about 5 dm. high, from a thick rootstock, pubescent with short appressed hairs, rather naked below: leaves scattered, the lowermost petioles about 6 cm. long, the upper half as long, pubescent like the stem; leaflets 7-9, oblong-oval, 4 cm. long, 1 cm. wide or less, shortly pointed at the apex, gradually narrowed to the base, yel-

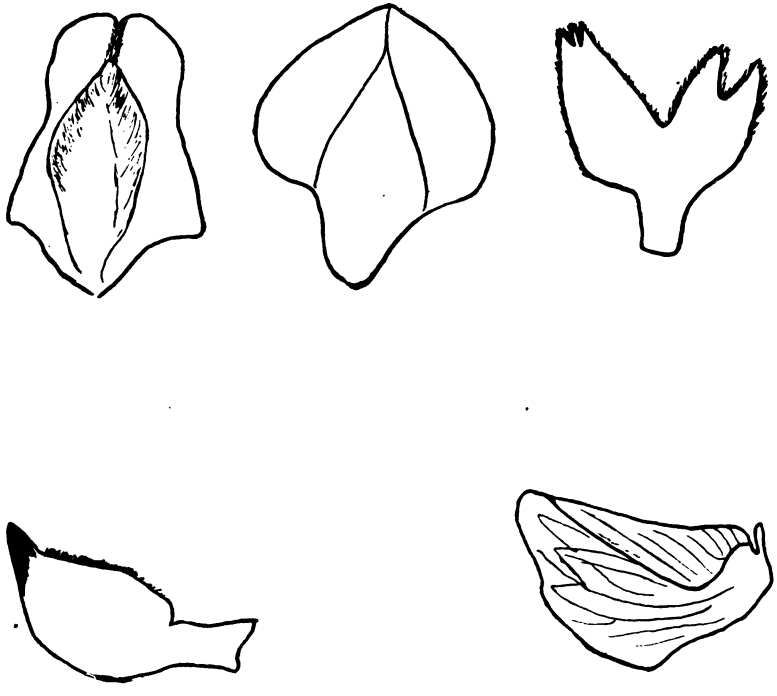

Figure 12. Floral parts of *Lupinus silvicola*, enlarged.

low-green on both sides, especially above, the lower slightly glaucescent, pubescent on both sides with short, appressed, but not dense hairs, the midvein prominent: peduncles short, from almost sessile to 3 or 4 cm. long: inflorescence 1 dm. long or less, 2 cm. across: bracts lanceolate, 4 mm. long, 1 mm. wide at

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base, caducous: pedicels 3 mm. long, sericeous; calyx densely white silky, the upper lobe 3 mm. long, 2-toothed, the teeth 1 mm. long, with a rather broad sinus, the lower lobe 5 mm. long, shortly 3-toothed; flowers violet-blue, 1 cm. long, 6 mm. deep, space between apices of banner and wings 3 mm.; banner with the edges turned back and almost parallel, slightly flaring at base and a little contracted at the middle, the face rather narrow, between 2 and 3 mm. wide, deeply grooved, the upper half not much turned back, prolonged at base into a spur 1 mm. long; wings obliquely open below, exposing the keel to a little above the calyx, the two when united about 3 mm. broad, with a broad and shallow groove on either side of the edges where they fit against the lower half of the banner; keel moderately curved, 4 mm. deep across the middle, ciliate except at the short pointed purple apex. Figure 12 shows a tracing of the banner, made with the aid of a camera lucida from a fresh flower, in addition to the usual outline drawing of the flattened banner.

The type, in the herbarium of the Nevada Agricultural Experiment Station, is my no. 9857, collected July 16, 1909, at Summit, Placer county, California, elevation 7000 feet. It is abundant in the forest to the westward and a little below Summit Station, growing in open places near pine trees in gravelly soil. In 1903 I collected it at Donner Lake, elevation 6000 feet, and distributed it under the name *L. calcaratus*, no. 6944. It is somewhat related to that species, as denoted by the pubescence and the general shape of the flower, which is longer than deep, but it has both calyx lobes green and silky, and the smaller flowers are blue instead of white, the banner not pubescent on the back, the wings do not have such a low and broad inflation, and the inflorescence is not so dense.

There are three other specimens in our collection, all from the vicinity of Webber Lake, California, collected by P. B. Kennedy and S. B. Doten. Nos. 69 and 136 are labeled *L. calcaratus*, while no. 148 bears the name *L. meionanthus*. There is a possibility that it has also been called *L. caudatus*, but I have seen no specimens so labeled. So far we have no specimens of this species from Nevada, but it should be looked for in the mountains along the Truckee river and on the shores of Lake Tahoe.

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NEW COMBINATIONS—III

By A. A. Heller

Toxicoscordion exaltatum (Eastw.)
Zygadenus exaltatus Eastw. Bot. Gaz. **41:** 283. 1906.

Toxicoscordion micranthum (Eastw.)
Zygadenus micranthus Eastw. Bull. Torr. Club, **30:** 483. 1903.

Oakesiella nitida (Britton)
Oakesia sessilifolia var. (?) *nitida* Britton, Trans. N. Y. Acad. Sci. **9:** 13. 1889.
Uvularia nitida Mackenzie, Torreya **8:** 14. 1908.

Triteleia bicolor (Suksd.)
Brodiaea bicolor Suksd. W. Am. Sci. **14:** 2. 1902.
Hookera bicolor Piper, Cont. U. S. Nat. Herb. **11:** 190. 1906.

Hookera Purdyi (Eastw.)
Brodiaea Purdyi Eastw. Proc. Cal. Acad. II. **6:** 427. *pl. 58.* 1896.

Fritillaria micrantha
Fritillaria parviflora Torr. Pac. R. R. Rep. **4:** 146. 1857. Not *F. parviflora* Mart. 1838.

Dondia Richii (Fernald)
Suaeda Richii Fernald, Rhodora **9:** 145. 1907.

Oreobroma aridorum (Bartlett)
Lewisia pygmaea var. *aridorum* Bartlett, Bot. Gaz. **44:** 303. 1907.

Limnia bulbifera (Gray)
Claytonia bulbifera Gray, Proc. Am. Acad. **12:** 54. 1876.
Claytonia sibirica var. *bulbifera* Gray, Proc. Am. Acad. **22:** 281. 1887.
Montia bulbifera Howell, Erythea **1:** 39. 1893.
Montia sibirica var. *bulbifera* Robinson, Syn. Fl. **1:** part 1, 273. 1897.

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Limnia rosulata (Eastw.)
Montia rosulata Eastw. Proc. Cal. Acad. III. **1**: 79. 1897.

Limnia rubra (Howell)
Montia rubra Howell, Erythea **1**: 38. 1893.
Claytonia parviflora var. *depressa* Gray, Proc. Am. Acad. **22**: 281. 1887.
Montia parviflora var. *depressa* Robinson, Syn. Fl. **1**: part 1, 274. 1897.
Montia depressa Suksd. Deutsch. Bot. Monats. **16**: 221. 1898.

Limnia saxosa (Brandegee)
Claytonia saxosa Brandegee, Zoe **4**: 150. 1893.
Montia saxosa Brandegee; Robinson, Syn. Fl. **1**: part 1, 274. 1897.

Limnia spathulata (Dougl.)
Claytonia spathulata Dougl.; Hook. Fl. Bor. Am. **1**: 226. *pl. 74.* 1833.
Montia spathulata Howell, Erythea **1**: 38. 1893.

Limnia Viae (A. Nelson)
Montia Viae A. Nelson, Bot. Gaz. **42**: 48. 1906.

Ammodenia oblongifolia (T. & G.)
Honckenya oblongifolia T. & G. Fl. N. A. **1**: 176. 1838.
Arenaria peploides var. *major* Hook. Fl. Bor. Am. **1**: 102. 1830.
Arenaria sitchensis Dietr. Syn. Pl. **2**: 1565. 1840.
Ammodenia major Heller, Catalog 4. 1898.

Ammodenia maxima (Fernald)
Arenaria peploides var. *maxima* Fernald, Rhodora **11**: 113 1909.

Tissa leiosperma (Kindb.)
Lepigonum leiospermum Kindb. Monog. Lepig. 23. 1863.
Spergularia leiosperma F. Schmidt, Reisen in Amurl. 131. 1868.

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Entered as second-class matter November 24, 1908, at the post office at Reno, Nevada, under the Act of Congress of March 3, 1879.

ANNOUNCEMENT

A new edition of the Catalog of North American Plants is in preparation. Thus far 116 pages have been printed, and other parts will follow as fast as possible. In all there will be about 300 pages. Since a considerable time must elapse before the work can be completed, the 116 pages and other parts as soon as issued, will be sent to those who wish to have them in that form, for $1.25, payment to be sent with the order.

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Volume 6 Number 8

MUHLENBERGIA

AUGUST, 1910

Editors: A. A. HELLER and P. BEVERIDGE KENNEDY

Lepidium perfoliatum L.

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Volume 6 October 29, 1910

MUHLENBERGIA

PLANT DISTRIBUTION ON THE TRUCKEE-CARSON PROJECT, FALLON, NEVADA

By P. Beveridge Kennedy

This immense valley, in many ways different ftom others in the state, is being so rapidly settled with farmers, that it would seem advisable to have on record the more important plants that form the native vegetation on the different kinds of soils.

The area of the project is about forty miles from Derby on the west to Stillwater on the east, and about the same distance from Carson lake on the south to the Carson sink on the north. The rivers utilized for the supply of water for the project are the Truckee and Carson. The former rises at Lake Tahoe in the Sierra Nevada mountains, and rapidly winds its way down the eastern side of the range until it reaches the Truckee valley, passing through Reno, and continuing eastwardly through the Virginia mountains by way of the Truckee Pass. On the eastern side of the Pass the government has constructed an immense diverting dam and canal which takes the waters in a southeasterly direction, and almost opposite to the natural flow of the river, which a few miles further down, at Wadsworth, changes its course directly northward and empties into Pyramid lake.

The Carson river comes also from the Sierra Nevada mountains, but farther south, traversing the Carson and Eagle valleys, in which the towns of Carson and Gardnerville are situated, and passing through the Virginia mountains by way of Dayton and Churchhill to the Truckee-Carson project. From Churchhill it crosses the project in a northeasterly direction, spreading out into numerous sloughs and bottoms, one branch passing near Fallon and going directly to the Carson sink, while another tends in a southerly direction to Carson lake. A branch known

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as New river, on account of its once being an irrigation ditch, but washed out by floods into a large channel, slowly winds its way through dense sloughs of cat tails and sedges through Stillwater and toward the sink.

The elevation of the valley is about 4000 feet, varying a few hundred feet only throughout the entire area. Occasionally there may be a summer rainstorm, but usually the only precipitation is during the winter months, and then only two or three inches.

Soda lake, evidently a crater, much below the general level of the valley, contains alkali water which when evaporated is used commercially for soda.

Carson lake, on the southern border, seems to be gradually receding, as the shore line keeps changing. It was over two miles farther out in 1881 than it is to-day. Surrounding this lake there is about three feet of peaty soil, composed of decayed cat tails, tules, grasses and sedges, and beneath a pure silver sand, abundantly supplied with broken shells and fossils.

The soils are varied in character, and intermix to a great extent, partly on account of their subjection to floods in some areas and the winds blowing up one type of soil partly over another one. In general, however, the soils along the rivers are rich in humus and were originally covered largely with the common sage brush, *Artemisia tridentata*, and the big rabbit brush, *Chrysothamnus graveolens* and *Greenei*. *Artemisia ludoviciana* and *Verbena prostrata* are not infrequent on the low lands along the rivers. It is to be noted here that considering the size of the valley, there is very little true sage brush in it, as compared with other valleys in the northern and central parts of Nevada.

The native trees along the rivers are Fremont's cottonwood, *Populus Fremontii*, the balsam cottonwood, *Populus trichocarpa*, and occasionally the aspen, *Populus tremuloides*. Among the willows that attain the height of trees are *Salix Scouleriana* and *Salix amygdaloides*. On certain low flats the buffalo berry, *Lepargyraea argentea*, is plentiful. In these low and partly flooded lands along the rivers are numerous species of *Carex*, *Juncus*, *Eleocharis*, as well as the common cat tail, *Typha an-*

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gustifolia. In addition to the above, there are a number of true grasses entering into the composition of the native hay, including species of *Poa*, *Elymus*, *Agropyron*, *Sporobolus* and *Leptochloa.* Two native clovers, *Trifolium spinulosum* and *T. subsalinum*, are frequently quite abundant.

We have given considerable attention in this region to the relationship of the soil to the native vegetation, hoping to find typical plants growing in certain kinds of soils. Our observations lead us to different conclusions from those published by others. In Bulletin 157, U. S. Department of Agriculture, Bureau of Plant Industry, page 32, referring to *Sarcobatus vermiculatus* and *S. Baileyi*, we read: "The presence of greasewood is an almost certain indication that alkali occurs somewhere within reach of its roots."

We have found the big greasewood growing in almost all kinds of soils and intermixed with many other native plants generally considered not tolerant of alkali. The common sage brush, *Artemissa tridentata*, is a good example. Over considerable areas one can find the sage brush and the greasewood with their roots so closely interlocked with one another that they must both be subjected to identical soil conditions. Yet both species have made a growth of many feet, and above the average as representatives of their kind. Again, the little greasewood, *Sarcobatus Baileyi*, grows in an entirely differ nt character of soil, almost separated from its relative, and on high, dry, sandy areas. The big greasewood does, of course, grow on lands strongly impregnated with alkali, but that wherever we find the greasewood we are to conclude that the soil is strongly alkaline, either at the surface or at greater depths, seems in the opinion of the writer to be far from proven. It is also very doubtful whether the sandy lands supporting the little greasewood should be considered alkali lands. The subject needs more than casual observation and will need many chemical analyses of the soil from about the roots of many plants.

The position given to lands covered with a luxuriant growth of greasewood by Dr. Hilgard in his most excellent work on soils must, at least so far as the Truckee-Carson project is con-

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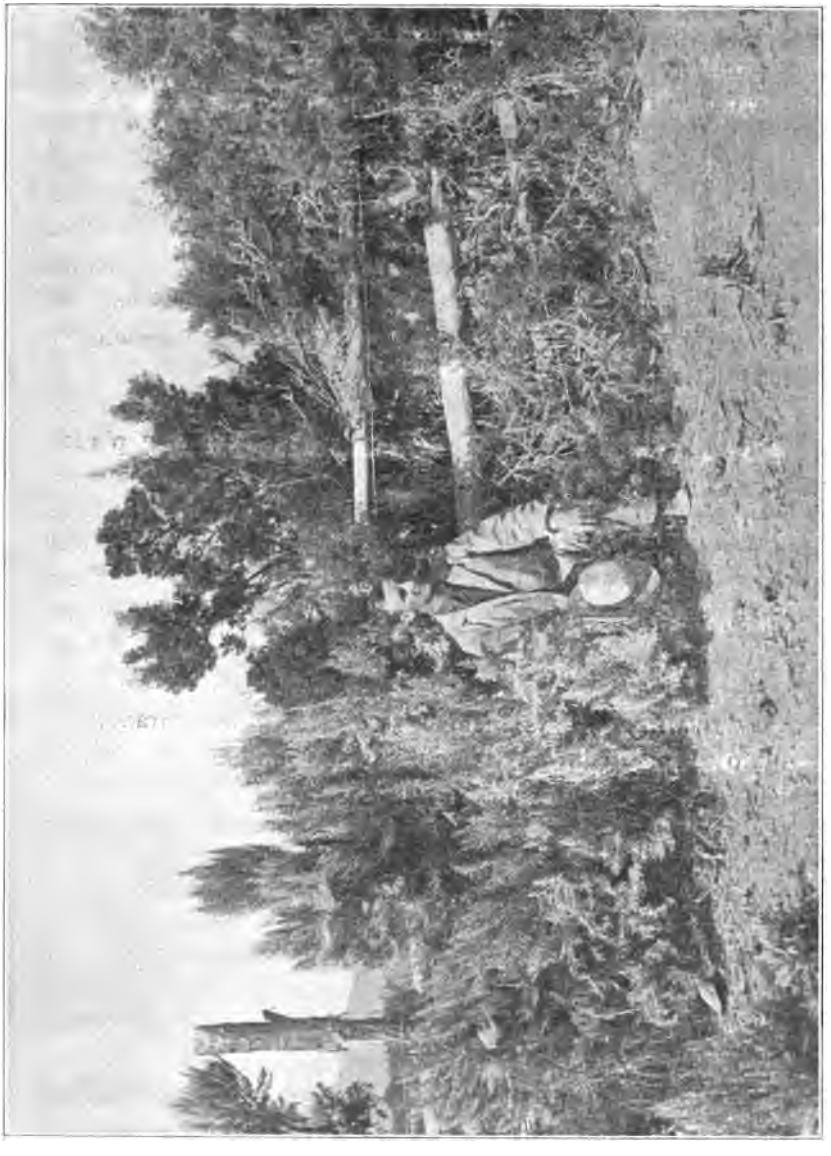
Plate 3



Sage brush, and greasewood (beyond the fence), growing together near Churchhill, Nevada

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cerned, be greatly modified. Many sections of land on this project that were almost exclusively covered with this plant have been cleared and ploughed and found immediately productive of alfalfa and grains without the application of gypsum, and before any washing out or underdraining had been done. From observations in the Honey lake region, however, where Dr. Hilgard was familiar with the conditions, we are inclined to believe that the conclusions he comes to in regard to the plant as it occurs there are correct. My contention is that greasewood will sometimes grow luxuriantly on lands well adapted for agricultural crops, and that this soil apparently in many instances contains little or no black alkali. If we were to condemn the lands on the Truckee-Carson project that were producing a luxuriant growth of greasewood, then we would have excluded from entry more than half of the lands which to-day are good farms. There is an excellent field here for the co-operation of a botanist and chemist in the study of the relationship of this plant to the soil.

Some of the other plants mentioned can not always be considered as alkali indicators. The salt grass, *Distichlis spicata*, blue weed, *Heliotropium spathulatum*, and the iodine weeds, *Dondia diffusa* and *D. Torreyana*, so far as the writer has observed, are always to be found where there is more or less alkali in the soil, but in the case of poverty weed, *Iva axillaris*, it is more a case of moisture than alkali, as it occurs in other parts of the state on our best sage brush lands. The presence of many of the species of saltbushes *Atriplex*, and the rabbitbrushes, *Chrysothamnus*, need not cause any anxiety to the homesteader in the growing of crops. The shad scale, *Atriplex canescens*, is generally found on soil of good quality.

There are large areas in the vicinity of Stillwater covered exclusively with a large saltbush, *Atriplex Torreyi*, and difficult to penetrate, the shrubs reaching beyond one's shoulders. Here quail are abundant and find a comparatively safe retreat. This land appears to be excellent in quality, and although somewhat alkaline when ploughed up, has produced good crops of wheat.

It is in the region along the borders of the sloughs, from Stillwater to the Carson sink, that we find true alkali indicator

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plants growing abundantly, as *Allenrolfia occidentalis*, *Salicornia herbacea*, *Distichlis spicata* and *Sesuvium sessile.*

There are many large clay flats interspersed throughout the lower areas which are absolutely barren of all vegetation. These increase in extent towards the Carson sink region, where there are hundreds of acres devoid of plant growth. The character of these lands is well described in Bulletin 157 of the Bureau of Plant Industry of the United States Department of Agriculture. Where the sand has blown up in small hummocks from higher areas, we will find a few scattered plants of greasewood on these barren flats.

Atriplex confertifolia is another common plant in the region found on a variety of soils, but mostly those of a firm, dry, sandy or gravelly nature, and with very little organic matter.

On comparatively level areas of loose sand and gravel we have the bird sage, *Picrothamnus desertorum* and the squaw berry, a species of *Lycium.* The little greasewood, *Sarcobatus Baileyi*, is also found on land of this character, but usually more rocky.

On the volcanic ash among the cinders of the crater forming Soda lake we collected *Psathyrotes annua. Iva nevadensis* was plentiful on the outer slopes, and scattered plants of white sage, *Eurotia lanata*, were seen. This plant is not common in the region, although in other parts of the state whole valleys may be covered with it almost exclusively. Another plant found in this vicinity only in drifting sand, was a species of *Dicoria*, which we have called *Dicoria Clarkae.* Indian millet or bunch grass, *Eriocoma cuspidata*, is about the only grass growing on these sandy lands. It is still abundant enough to be of value to the range stock.

The sands in the vicinity of Wadsworth and Fernley have *Parosela polyadenia* as one of their chief plants. On some sandy lands where the soil has a tendency to form dunes, we find *Tetradymia canescens*, *T. Nuttallii*, and more rarely *T. spinosa*. *Astragalus lentiginosus* is becoming more plentiful along the canals, and seems to flourish with the additional moisture. *Chaetadelpha Wheeleri* is especially plentiful the first year after

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ploughing the sand for a homestead. *Brachyactis frondosus* and *Polypogon monspeliensis* seem to find a congenial home in the drain ditches where it is more or less moist and alkaline.

Two species of *Eriogonum*, *E. Baileyi* and the so called *E. angulosum*, are occasionally met with in patches on sandy land. *Cleome lutea*, *Solanum triflorum* and *Chenopodium Botrys* grow as weeds along the irrigation canals. *Euthamia occidentalis* is abundant along the old irrigation ditches.

Among the most ornamental annuals are the sand verbenas, *Abronia crux-maltae* and *A. turbinata*. The mallows are represented by three species, an orange-red *Sphaeralcea*, *S. ambigua*, and two weeds, *Malva rotundifolia* and *M. parviflora*. The only cactus that we know of in the regiou is *Opuntia pulchella*.

NOTES ON THE FLORA OF NEVADA—III

By A. A. Heller

Lepidium perfoliatum L. Sp. Pl. 643. 1753.

Early in May, 1909, I chanced upon this curious crucifer while waiting for train connections at Derby, a way station some miles east of Reno. Two plants only were found growing in the cinders along the track. A search in our manuals and other books failed to identify it specifically, nor could it be found in Bentham and Hooker's British Botany.

Late in May of the present year I found it growing rather plentifully along the railroad at Hood River, Oregon, and had it named for me by Mr. M. W. Gorman, of Portland. Later it was found in quantity along the railroad at Pendleton, Oregon. Shortly afterward Professor C. P. Smith, of the Utah Agricultural College told me that it has also been found in Utah, and I think showed me specimens collected by himself. Since that I have seen plants collected near Salt Lake City by Mrs. Joseph Clemens. A specimen was brought in during the summer by Mr. C. L. Brown, who found it on Virginia street, Reno.

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Apparently this plant has not heretofore been recorded as occurring in America. But it has now undoubtedly come to stay, and should have a place in our descriptive texts. While the upper stem leaves are apparently perfoliate, they are not really so, but are auricled, the lobes overlapping, causing the perfoliate appearance. Linnaeus gives its habitat "in Persia, Syria."

LATHYRUS LANSZWERTII Kellogg, Proc. Cal. Acad. **2**: 150. *f. 44.* 1861.

"The following species of *Lathyrus* was sent from Washoe by Dr. Lanszweert.

"*Lathyrus Lanszwertii*, (Kellogg.) Fig. 44.

"Stem slender, acutely quadrangular and striate naked, below; sparsely somewhat appressed pubescent above, ascending one to two feet in height.

"Leaflets three to four pairs, linear-oblanceolate, cuneate, entire, sub-acute, mucronate, sub-sessile, opposite, five to seven-nerved, sub-pubescent, lamina rather rigid, thin, veins prominent, petiole sulcate, striate, angled, tendrils three-parted, pubescence loosely appressed. Stipules semi-sagittate, linear-lanceolate, sub-falcate, entire, very acute or nearly subulate pointed, upper third sparsely pubescent, ciliate, nerved.

"Peduncles shorter than the leaves (one to two inches long), angled, one to four flowered, flowers pale flesh-colored, rather large. Calyx tubular-campanulate, somewhat two-lipped, teeth broad or triangular-lanceolate, two upper deeply cleft, short; all one to three-nerved, (the marginal veins scarcely to be regarded as lateral nerves). Calyx also nerved from the sinuses, margins ciliate. Vexillum obovate, emarginate, cuneate, margins minutely waved; wings adherent to the keel, oblong, wrinkled, the internal tooth-like process large, causing a conspicuous swell or outward curve at the origin of the claws, tufted, bearded on the upper side below the stigma, and thence a scabrous bearded line extending down nearly the whole length. Embryo legume straight, oblanceolate, compressed, four to six-seeded, glabrous. Mature fruit unknown."

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Plate 4

Lathyrus Lanszwertii Kellogg. A copy of the original figure.

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This species is referred to *L. palustris* as a synonym in Watson's Bibliographical Index, and has been so placed by subsequent writers. The original of the Linnaean species came from swampy pastures of northern Europe. The only definite things in the descriptions cited by Linnaeus are that the peduncles are many flowered and the stipules lanceolate. In the Illustrated Flora it is described and figured as having a winged stem, and the "peduncles generally about equaling the leaves." The stems of *L. Lanszwertii* are not winged, and the combined length of peduncle and inflorescence is considerably shorter than the leaves.

In 1894 Theodore G. White, in the Bulletin of the Torrey Botanical Club, offered a revision of the genus, publishing as new *L. coriaceus*, the type being Watson's no. 297, "found in the Wahsatch Mountains, Utah; 5-6,000 feet altitude." He also included a specimen collected in Oregon.

We have several specimens of *L. Lanszwertii* from the mountains west of Reno, all labeled *L. coriaceus*, and last July I found it on Slide mountain west of Washoe, at an elevation of 7500 feet, growing on moist banks near a mountain stream, in rather tangled clumps, the stems two to two and a half feet long. The full sized but not mature pods are glabrous, 5 cm. long, 9 mm. wide. The leaves on nearly all of these Slide mountain specimens are narrower and more acute than in Kellogg's type as figured, but some of the leaves of other specimens are broader and not so pointed.

Whether *L. coriaceus* can be held as distinct, I am not prepared to state. Rydberg's 6152 from hills north of Salt Lake City, which is in the type region of *L. coriaceus*, differs mainly from our specimens in having thicker and broader leaflets, but in form they agree very well with Kellogg's figure. I have a specimen in my own collection, gathered about Lake Tahoe by Mr. Robert L. Pendleton, which has narrower leaflets than any of our Nevada specimens, showing that the species is variable in this respect. An examination of the flowers from several plants shows that the blade of the wing is 1 cm. long and 6 mm. wide across the middle. While Kellogg's characterization of oblong

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is hardly incorrect so far as shown by measurements, the rounded middle part of the dorsal edge would incline me to designate it as obliquely oblong at least, which gives a somewhat better idea of the shape.

Miss Eastwood's description of *L. Goldsteinae*, Bull. Torr. Club **32**: 197. 1905, seems to answer perfectly to our plant, except that she does not mention the emarginate banner. She also describes the wings as oblong. The style in her type is "sparingly hairy half way from the tip," while in our plants it is hairy just below the tip, with some faint traces of the "scabrous bearded line extending down nearly the whole length" mentioned by Kellogg. While I have not seen the type of *L. Goldsteinae*, I am inclined to think it is the same as *L. Lanszwertii*.

Our specimens are *Kennedy 1624* and *1230*, respectively from Hunter creek canyon and Galena creek, Washoe county, and *Heller 10204* from Slide mountain, Washoe county. These localities are only a few miles east of the type station of *L. Goldsteinae*, and Kellogg's type no doubt came from this same region. He says "sent from Washoe," and the present Washoe, lying at the foot of Slide mountain was once a populous mining camp. But in those days Nevada was called Washoe, although botanically it was the country about the towns of Washoe, Virginia City and Carson.

SENECIO ADAMSII Howell, Fl. N. W. Am. 379. 1900.

No. 9896, collected July 29, 1909, on Mt. Rose, elevation 9650 feet, just below timber line, growing in damp sandy places. It is plentiful on the north side of Mt. Rose, and was collected again this year at an elevation of 10000 feet, above timber line, in a moist basin where the snow drifts last until midsummer or longer. Heretofore it has been reported from the type locality only, Mt. Adams, Wash. Determined by Dr. J. M. Greenman.

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NEW COMBINATIONS—IV

By A. A. Heller

Tissa marginata (DC.)
Arenaria marginata DC. Fl. Fr. **5:** 793. 1815.

Tissa salina (J. & C. Presl)
Spergularia salina J. & C. Presl, Fl. Cech, 95. 1819.
Tissa marina Britton, Bull. Torr. Club **16:** 126. 1889.

Arenaria suffrutescens (Gray)
Brewerina suffrutescens Gray, Proc. Am. Acad. **8:** 620. 1873.
Arenaria congesta var. *suffrutescens* Robinson, Proc. Am. Acad. **29:** 295. 1894.

Robinson, l. c., and in the Synoptical Flora, cites this as "*Brewerina suffrutescens*, Gray, Proc. Am. Acad. viii. 620, under *A. congesta*," but in the original publication Gray does not mention *A. congesta*.

Viorna Bigelovii (Torr.)
Clematis Bigelovii Torr. Pac. R. R. Rep. **4:** 61. 1857.
Clematis Pitcherii var. *Bigelovii* Robinson, Syn. Fl. **1:** part 1, 6. 1895.

Viorna dictyota (Greene)
Clematis dictyota Greene, Pittonia **5:** 135. 1903.

Viorna Fremontii (Wats.)
Clematis Fremontii Wats. Proc. Am. Acad. **10:** 339. 1875.

Parosela Anthonyi (Brandegee)
Dalea Anthonyi Brandegee, Erythea **7:** 2. 1899.

Parosela urceolata (Greene)
Dalea urceolata Greene, Leaflets **1:** 199. 1906.

Parosela terminalis (Jones)
Dalea terminalis Jones, Cont. West. Bot. 12: 8. 1908.

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MUHLENBERGIA

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ANNOUNCEMENT

A new edition of the Catalog of North American Plants is in preparation. Thus far 116 pages have been printed, and other parts will follow as fast as possible. In all there will be about 300 pages. Since a considerable time must elapse before the work can be completed, the 116 pages and other parts as soon as issued, will be sent to those who wish to have them in that form, for $1.25, payment to be sent with the order.

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1910

Volume 6 Number 9

MUHLENBERGIA

SEPTEMBER, 1910

Editors: A. A. HELLER and P. BEVERIDGE KENNEDY

Lupinus caudatus Kellogg

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University of Nevada,
Reno, Nevada

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Volume 6 November 29, 1910

MUHLENBERGIA

THE NEVADA LUPINES—V

By A. A. Heller

Prostrati

Lupinus Breweri Gray, Proc. Am. Acad. 7: 334. 1867.

"Fruticulosus, ramosissimus, caespitoso-humifusus pube appressissima argenteo-sericeis; stipulis subulatis, foliolis 7-10 spathulatis cuneatisve retusis (lin. 3-4 longis); racemo brevi (pollicari) densifloro, calycis bracteolati labio superiore bipartito; corolla violaceo; carina vix ciliata.—"Prostrate, trailing on

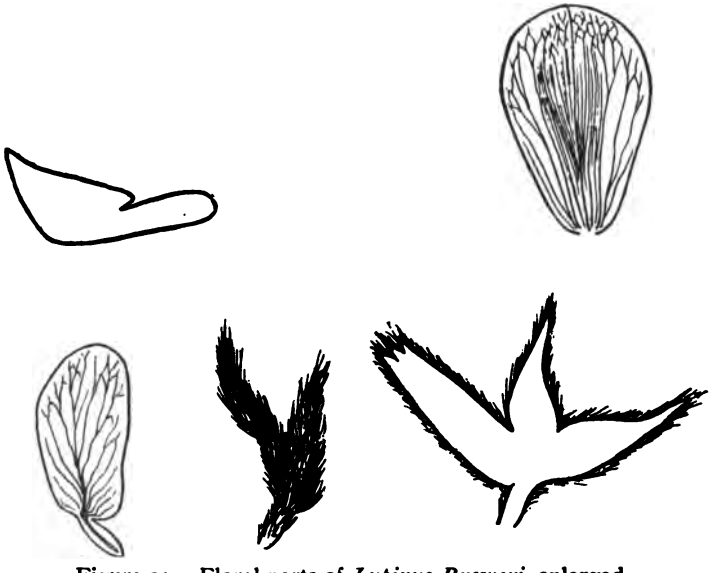

Figure 13. Floral parts of *Lupinus Brcweri*, enlarged.

the ground, or on rocks on the Yosemite trail, alt. 6,000 feet," Prof. Brewer. Nevada near Carson, Dr. C. L. Anderson; a form with flowers only 3 lines long, the keel not in the least ciliate;

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while in Prof. Brewer's specimens the flowers are 4 or 4½ lines long, and with a few hairs on the margins of the keel.—This ranks with the andine species forming Agardh's tribe *Microphylli*."

A matted perennial with branching woody rootstocks 5 mm. or more in thickness, the herbaceous stems commonly rising 1 dm. or less above the ground, but spreading in mats 2 to 3 dm. across. Even in my Yosemite specimens I can see no evidence that the leaflets are retuse as described by Gray. They are spatulate or oblanceolate, the largest about 15 mm. long, 5 mm. wide, the rounded apex with a very short blunt mucro. The calyx is 7 mm. long, the upper lobe cleft for 5 mm., the divisions lanceolate-acuminate, the sinus V-shaped, the apices 3 mm. apart when spread out. Since nothing is said about the lower lobe in the original description, the inference is that it is entire. It is slightly longer than the upper, oblong, minutely 3-toothed. The corolla is 1 cm. long, the apices of wings and banner about 2 mm. apart, the banner obovate, 9 mm. across, with a yellowish or whitish spot on the face, the edges not strongly reflexed. The wings are widely inflated, 6 mm. deep at the middle. The keel is sparingly bearded at and a little above the middle.

The above notes are taken from my 9006, collected in Little Yosemite Valley, California, in the type region.

Until last summer I had seen but a single collection of this species from Nevada, made by Mr. C. L. Brown on Slide mountain above Washoe. On July 23, 1910, I found it growing abundantly on the west side of Slide mountain in granitic gravel in bare open places at an elevation of about 8500 feet. The species probably has a preference for granite.

As noted by Gray, the Nevada specimens have somewhat smaller flowers, being only 8 mm. long, but the length of the calyx is about the same, 7 mm. While the parts of the corolla are necessarily smaller, their shape is the same as in those from the Yosemite, and the keel is glabrous as described. The floral parts illustrated in figure 13 were taken from the Nevada specimens collected by Mr. Brown.

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CALCARATI

Flowers commonly white, the upper calyx lobe colored like the flower; pubescence not dense	L. calcaratus
Flowers commonly violet; both calyx lobes green; pubescence dense, appressed	L. caudatus

LUPINUS CALCARATUS Kellogg, Proc. Cal. Acad. **2**: 195. *f.* 50. 1862.

"Lupinus calcaratus (Kellogg). Fig. 60.

"Stem erect, eight to ten inches in height, somewhat appressed, silky pubescent throughout, leafy; leaflets seven to ten, arcuate, caniculate, lance-linear acute, mucronate, narrowed at the base, silky alike on both surfaces, half the length of the petiole, the upper nearly equal; stipules ovate, acuminate, persistent.

"Flowers numerous, in a rather close alternate raceme; bracts lance-subulate, as long, or often twice the length of the pedicels, caducous.

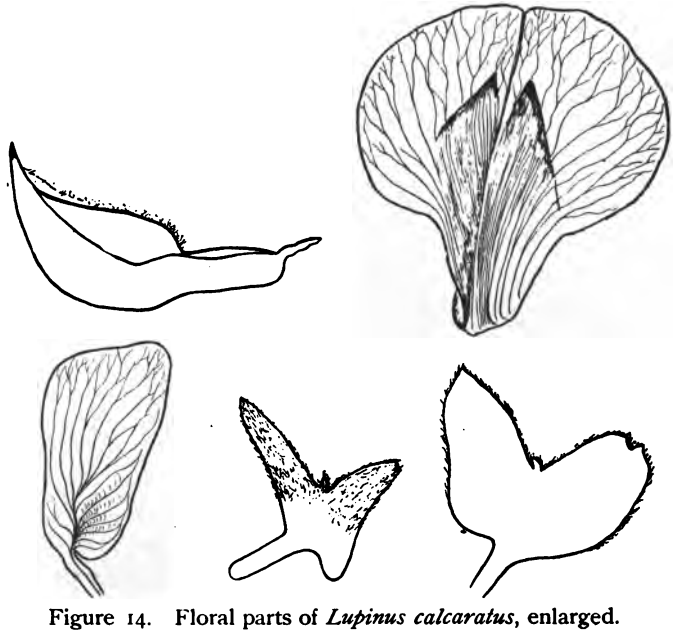

Figure 14. Floral parts of *Lupinus calcaratus*, enlarged.

"Calyx silky villous, spurred, and with the upper lip colored (white), minutely bracteolate, upper lip two-toothed, short,

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erect; lower lip carinate, ovate, acute, entire, color pale green, inclining to white. Banner roundish, with a long reflected claw, pubescent on the back; wings oblong, externally puberulent toward the apex, &c.; keel ciliate; stigma naked; pods hairy, four-seeded.

"This species is near *L. laxiflorus*. The spur is remarkably long, exceeding the pedicels; (but *L. laxiflorus*) is described as having blue flowers. This, as before stated, has no[t only] white flowers, but half the calyx, including the spur, is also white; the stem certainly is not "glabrous," as some have described *laxiflorus*, nor are the petioles of the leaves short, nor the points of the leaflets obtuse; the stipules are neither subulate nor caducous, nor is the raceme what we would designate as loose and elongated.

"Finally, the white flowers and half colored calyx, which could by no means be spoken of as *slightly saccate*, induce us to consider it as a new species."

The type locality of this species is not given, but according to Mrs. Curran, Bull. Cal. Acad. **1**: 135, it was "collected by C. H. Dorr, near Virginia City, Nev." It is an inhabitant of forests in open gravelly places, and also of treeless ridges among the sage brush. I first found it in 1909 under the latter conditions on the ridge south of Alum creek, Washoe county, some eight or ten miles southwest of Reno (nos. 9744 and 9745). Whether Kellogg's type really had a spur longer than the pedicel I do not know, but so far I have found no plants in which the spur more than equals the pedicel, and it is usually shorter.

Watson evidently determined his "*L. sulphureus* Dougl." of the King Report upon the yellowish color of the flowers in herbarium specimens, for the plant collected by Bloomer on Mt. Davidson is plainly *L. calcaratus*. Later, in Proc. Am. Acad. **8**: 541. 1873, he refers to *L. calcaratus* his *L. laxiflorus* of the King Report, which he there says accords "exactly with authentic specimens in Herb. Gray," and this too is evidently an error, for the plant he describes there does not agree with *calcaratus*.

In Zoe **3**: 285, Jones writes as follows concerning a plant which is evidently *calcaratus:*

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"LUPINUS SULPHUREUS Douglas. This little known plant I discovered growing abundantly in Eastern Nevada, and I think it is quite probable that it will be found to be nearer *L. sericeus* than has been supposed. My notes on the flowers were taken as they grew. When the flowers are just opening they are white with a yellow streak in the middle of the banner, which is also flecked with 4 or 5 small purple spots; the whole flower soon turns yellow, the middle of the banner deeply so. The calyx is long-spurred, spur and all but the tip of the upper part of the calyx white and streaked with blue, the lower part of the calyx and tips green. It grows 1 to 2 feet high, in clumps from a hard woody root, on gravelly slopes, flowering in June. I have a very few specimens with a suspicion of blue on the banner."

L. sulphureus is probably confined to the Blue mountains of Washington and Oregon. It has a very different flower, which is shorter and rounder, and the banner is not prolonged into a spur, but is merely "sub-gibboso," as originally described.

L. calcaratus is easily distinguished from all other species by having the upper calyx lobe colored like the flower, the lower one green, and by the peculiar broad inflation of the wings, that part of the flower being broader than deep, an unusual feature in the genus. No. 9744, mentioned above, is fairly typical, with the exception that the spur is shorter than in Kellogg's figure.

No. 9745 might hastily be passed upon as a hybrid between *calcaratus* and *caudatus*. It was gathered with no. 9744, and when the plants were put to press was segregated. When fresh the flowers were pink tinged, the plant less green, and the pubescence more appressed. The inflation of the wings is not so low and broad, about intermediate between *calcaratns* and *caudatus*. In the dried state the flowers do not turn yellow, while those of typical *calcaratus* turn yellow when dry. It has the calyx of *calcaratus*, with the exception that the upper lobe is more prominently notched, and the banner is of that species. The pubescence is more like that of *caudatus*, though not nearly so dense. There was no *caudatus* at the particular place where these specimens were collected, but a few hundred yards beyond

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it began to appear and there *calcaratus* stopped, the two species overlapping but slightly.

With the exception of specimens from Humboldt and Eureka counties, all of ours are from the western part of the state, on the ranges adjacent to the Sierra Nevada mountains. It grows equally well in different soils, but seems to reach its greatest development in granite, being especially abundant on the slopes of Mt. Rose above Contact Pass, where its upper limit is at 9800 feet. It probably does not occur below 5500 feet. The following specimens from Nevada are in our herbarium:

EUREKA COUNTY: Eureka, *Frandsen*, May 28, 1903.

HUMBOLDT COUNTY: Paradise Valley, *Kennedy 1043*.

STOREY COUNTY: Virginia City (type locality) *Miss McDermott*.

WASHOE COUNTY: Mt. Rose *Keunedy 1187;* Longebaugh's wood camp, *Brown*, July 28, 1907; ridge south of Alum creek, *Heller 9744, 9745*.

Besides the above I have in my own herbarium specimens collected in King's canyon, Ormsby county, near Carson, *Baker 918* and *923*.

The drawings of the floral parts were made from my no. 9744.

LUPINUS CAUDATUS Kellogg, Proc. Cal. Acad. **2**: 197. *f. 61*. 1862.

Lupinus argentinus Rydb. Bull. Torr. Club **30**: 257. 1903.

"*Lupinus caudatus* (Kellogg). Fig. 61.

"Stems persistent, somewhat decumbent; leafy and branching, silvery or satiny, appressed pubescent throughout.

"Leaflets five to seven, linear-lanceolate, acute, mucronate, narrowed towards the base, about as long as the petiole.

"Stipules persistent, small lance-acuminate.

"Flowers blue, scattered and sub-verticillate, floral portion about twice the length of the peduncle, or two or three times the length of the petioles.

"Bracts caducous, twice the length of the pedicels; calyx tubular campanulate, upper lip straight, two-toothed, (not col-

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ored) short and somewhat subulately spurred at the base, (spur erect nearly half the length of the pedicel); lower lip entire, elongated, carinate; linear bracts conspicuous; banner satiny pubescent on the back, chiefly along the middle portion; wings with an erect claw.

"Keel silky-ciliate.

"Stigma naked.

"Legumes (embryo) linear, silky; seeded.

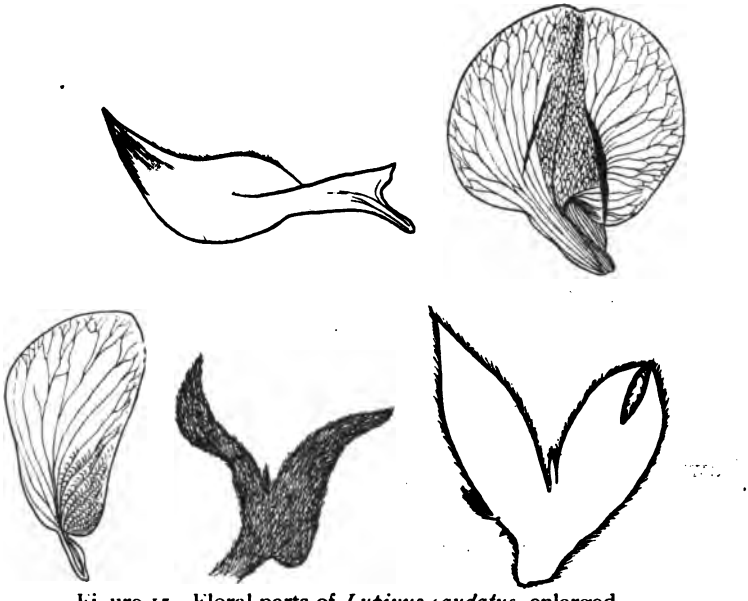

Figure 15 Floral parts of *Lupinus caudatus*, enlarged.

"Closely allied to L. calcaratus (Kellogg). But the general appearance is quite distinct, being very silvery sericeous, with blue flowers. The calyx is not colored; the upper lip straight; the spur short, sharp, and erect; the leaflets straight and radiating, only five or six in number; flowers also fewer, and the spike less crowded. Found in the same localities, but more rare."

The pods of this species are about 3 cm. long, 6 mm. wide, densely pubescent, 5 6-seeded, the seeds reddish or brownish or sometimes nearly white, smooth, somewhat lenticular, 4 mm. long and nearly as wide.

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The type of *L. argentinus* Rydb. was collected "near Reno, 1900," by Miss S. G. Stokes, but owing to a mistake on the label, was recorded as from Reno, Utah; but there is no Reno in Utah. Dr. Rydberg, to whom a specimen has been sent, pronounces our plant the same as his type.

L. caudatus has apparently been misunderstood by most writers. Watson, if he got it at all, probably included it under *L. flexuosus* in the King Report, which was made to include a wonderful mixture of species, as he acknowledges later in the Bibliographical Index. While our plant disagrees with Kellogg's description in several minor points, it does agree in the essential ones. He describes the bracts as twice the length of the pedicels, but I do not find any that long, and the pubescence shown in his figure disagrees with his description. He also says "spur erect, nearly half the length of the pedicel," but I find it not more than one-fourth as long. Otherwise our plants agree.

It is rather common in the vicinity of Reno, especially toward the Sierras, occurring at elevations of 5000 to nearly 8000 feet on open slopes among sage brush, as well as in open pine forests, growing in clumps. Kellogg evidently took his name from the "elongated, carinate" lower calyx lobe. The drawings of the floral parts and the cover illustration are from my no. 9751.

The following specimens are in my own and the Station herbaria:

DOUGLAS COUNTY: Spooner, *Baker 1134.*

ELKO COUNTY: Maggie creek, *Kennedy 650.*

ORMSBY COUNTY: Eagle valley, *Baker 1188;* Carson, *Steinmetz; Heller 9825.*

WASHOE COUNTY: Peavine, *Heizer*, June 16, 1901; *Heller 9767;* ridge south of Alum creek, *Heller 9751.*

Newcomb lake, *Kennedy*, June 18, 1901.

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ECALCARATI

LUPINUS ANDERSONI Wats. Bot. King Rep. 58. 1871.

"Specimens were collected near Carson City by Dr. Anderson, (9, 108, and 121,) very distinct in their habit, and seeming scarcely to belong to any described species. Slender and much branched, apparently 1 foot high, minutely puberulent throughout; leaflets 7, oblong-lanceolate, acute or obtuse, about equaling the petioles, (1-2 inches long;) racemes short or becoming elongated, (2-6 inches,) loosely flowered; flowers scattered or subverticillate, blue or ochroleucous, (3-6 lines long;) bracts small and ovate, much shorter than the pedicels; calyx broad-campanulate, but slightly gibbous, the lobes nearly equal, entire, somewhat obtuse; legumes subpubescent, 4-6-seeded, (15 lines long, 4 lines wide.)"

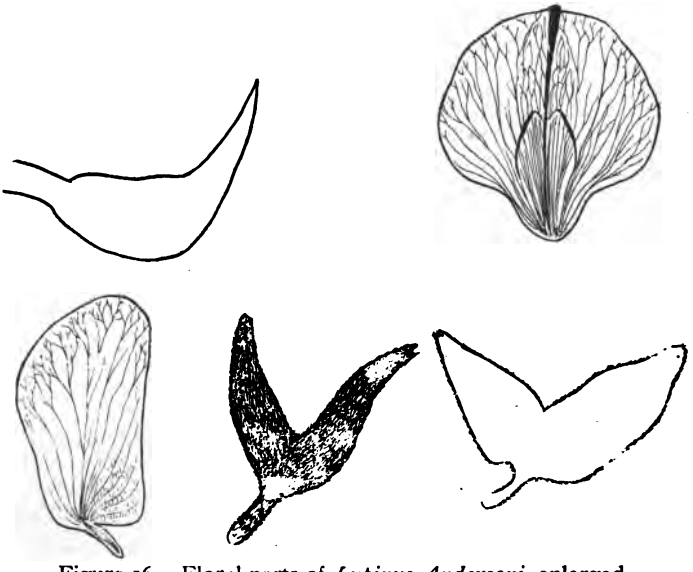

Figure 16. Floral parts of *Lupinus Andersoni*, enlarged.

Until last winter I had never been able to identity this plant. Among several species of lupines sent to Miss Eastwood for comparison at the Gray Herbarium, was one from the Sierra Nevada of California, sent out by me as an undescribed species, which she said was a near relative of *L. Andersonii.* This gave

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me a definite idea as to the appearance of the species, and I soon found a specimen of it in my own herbarium, C. F. Baker's 1348, collected in Clear creek canyon, Ormsby county, distributed as "*Lupinus silvestris* Drew," an untenable name, for which Dr. Greene had some years before substituted *L. Elmeri*. It was collected in the mountains west of Carson, and is from the type region.

Search in the Station herbarium brought to light another collection, *Kennedy 1448* from Incline, Washoe county, elevation 6300 feet. This had been determined by Professor Aven Nelson as *L. ingratus*, Greene, originally described from New Mexican material.

Last summer I collected it on the east slope of Slide mountain, elevation 6700 feet, and, as I recollect, in formation other than granite. Slide mountain proper is composed entirely of granite. The plant was found only in a narrow belt at the elevation noted, growing in rather rich soil in the forest where there is considerable undergrowth, and is evidently a woodland species. All of the plants observed had white or creamy flowers, but one of Kennedy's from Incline shows flowers with a trace of blue, thereby confirming the original diagnosis.

The plant is much taller than Watson had supposed, the larger ones being three feet high, and with a considerable spread of branches. The floral parts illustrated in figure 16 are taken from my Slide mountain specimens, no. 10208.

The leaflets are oblong or oblanceolate, obtuse, the largest 4 cm. long, 8 mm. wide, but those that are folded, as many are in drying, appear to be somewhat lanceolate and acute. They are equal to or longer than the petiole. The bracts are lanceolate-subulate, 4 mm. long, and are fairly persistent, thus appearing shorter than the pedicels (5 mm.) of mature flowers. The pubescence of peduncle, pedicel and calyx while short, is rather too prominent to be called "minutely puberulent." The upper calyx lobe is 2-toothed, according to all the flowers examined. As seen in the dried state, the banner appears to be a little shorter than the wings, its sides are not only turned back, but are somewhat inrolled, the face narrow and deeply grooved, es-

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pecially the portion hidden by the wings, the apex prolonged dorsally into a prominent point. The keel is glabrous as illustrated, the apex yellowish. The distance between the apices of banner and wings is about 5 mm.

Lupinus nevadensis sp. nov.

Perennial, stems several from a stout thick rootstock, 3 to 4 dm. high, pubescent with rather long spreading or somewhat appressed hairs and apparently puberulent beneath these, moderately leafy: basal leaves rather numerous on petioles 1.5 dm. long, those of the stem leaves successively shorter, the uppermost about 3 cm. long; leaflets commonly 9, oblong, acute, 4cm. long or less, 5 mm. wide, (3.5 cm. long, 8 mm. wide on some plants from type station), densely white villous below, less so

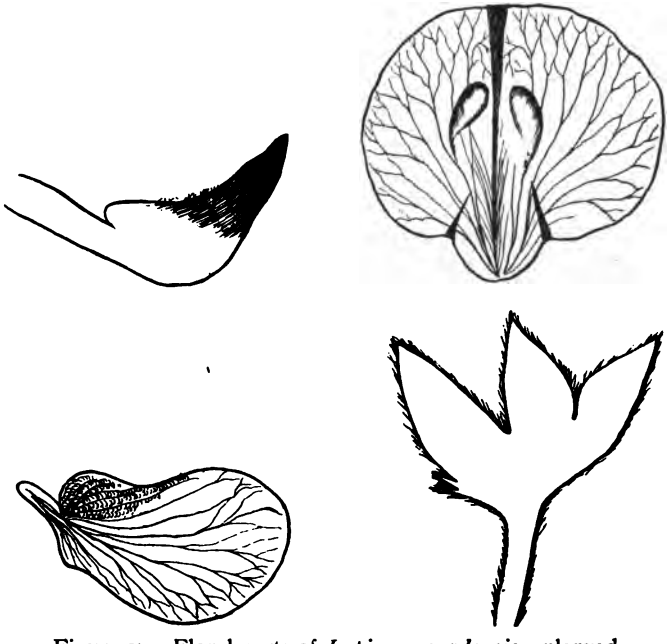

Figure 17. Floral parts of *Lupinus nevadensis*, enlarged.

above the green showing beneath the hairs: peduncles about 5 cm. long, rather stout: inflorescence up to 1.5 dm. long, lax below, crowded above: bracts subulate, densely villous, 5 mm.

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long, caducous: pedicels 7 mm. long, densely pubescent: calyx pubescent with spreading hairs, 10 mm. long, the lobes nearly equal, the upper cleft nearly to the base, the divisions lanceolate, acute, standing well apart; lower lobe lanceolate, minutely 3-toothed, 2 mm. wide at base; a subulate bractlet 2 mm. long at the base of the calyx on either side: flowers violet-purple, 12 mm. long, 7 mm. deep, distance between apices of banner and wings 5 mm.; banner with the edges slightly turned back but not parallel, forming a broad scoop-shaped body viewed from the rear, the upper part of the face short and broad, whitish, with a narrow purple dotted groove, the lower two-thirds concealed by the wings, the groove here broad (2.5 mm. wide), with a rounded process or callosity on either side at the elbow, glabrous dorsally; wings apparently a little shorter than the banner, 4 mm. broad and as deep, the lower edges open only under the calyx, the upper edges covered for two-thirds of their length by the face of the banner, which fits into a broad and rather deep depression: keel glabrous, strongly curved, 3 mm. deep at the middle, the attenuate apex purple.

The type, in the herbarium of the Nevada Agricultural Experiment Station, is my no. 9588, collected May 1, 1909, at Truckee Pass, Washoe county, Nevada, elevation about 4400 feet, growing among sage brush in the narrow valley along the Truckee river. It is rather common in the vicinity of Reno, for I have since found it on Peavine at about 6000 feet, on the ridges above Verdi, and on the hills along the Truckee three or four miles above Reno. At the higher elevations it does not grow so tall as at the type station. It is a handsome species when fresh, but the flowers, especially the banner, are inclined to fade if neglected in drying.

Specimens were sent to the Gray Herbarium last winter and reported upon by Miss Eastwood, who informed me that she could not identify them with any species there. The only plant known to me that bears a general resemblance to this species is an undetermined one collected at the Dalles and near Biggs, Oregon, on the Columbia river, but that has different floral characters. It is perhaps related to *L. sericeus* Pursh.

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A new edition of the Catalog of North American Plants is in preparation. Thus far 116 pages have been printed, and other parts will follow as fast as possible. In all there will be about 300 pages. Since a considerable time must elapse before the work can be completed, the 116 pages and other parts as soon as issued, will be sent to those who wish to have them in that form, for $1.25, payment to be sent with the order.

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Volume 6 Number 10

MUHLENBERGIA

OCTOBER, 1910

Editors: A. A. HELLER and P. BEVERIDGE KENNEDY

Lupinus meionanthus Gray

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University of Nevada,
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Volume 6 December 17, 1910

MUHLENBERGIA

THE NEVADA LUPINES—VI

By A. A. Heller

Ecalcarati—concluded

Lupinus montigenus sp. nov.

Perennial, stems simple, several to many from a thick root-stock, 3 dm. high, pubescent with white, somewhat appressed hairs, and apparently puberulent beneath these, leafy: basal leaves few, their petioles 1.5 dm. long, those of the stem leaves successively shorter, the uppermost 1 to 2 cm. long, pubescent like the stems; leaflets about 9, densely white villous, narrowly lanceolate, 3 cm. long, 4 mm. wide, acute or short acuminate: peduncles short, 3 to 4 cm. long: inflorescence rather loose, 1 dm. long or less: bracts lanceolate, acuminate, 6 mm. long, 3 mm. wide at base, persistent, densely white villous, as are the pedicels and calyx: pedicels 4 mm. long: calyx with a lanceolate bractlet at the base on either side which sometimes protrudes above the sinus; lobes nearly equal, the upper 7 mm. long, cleft into lanceolate, acute divisions, with practically no sinus, the edges of the divisions almost touching; lower lobe 8 mm. long, shortly 3-toothed: flowers violet-blue, 12 mm. long, 10 mm. deep, distance between apices of banner and wings about 4 mm.; banner with the sides turned back and parallel, a space of about 4 mm. between the edges, the face yellowish or whitish, a little more than half its length concealed by the wings, the free portion with a narrow groove, the banner nearly orbicular when spread out, 12 mm. across the middle; wings rather broadly inflated, open and loosely inclosing the keel, 6 mm. deep, not strongly curved dorsally; keel not strongly curved, violet toward the rather thick apex, the margins ciliate except at the very base and apex, 4 mm. deep at the middle.

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The type, in the herbarium of the Nevada Agricultural Experiment Station, is my no. 9880, collected July 29, 1909, on Mt. Rose, Washoe county, Nevada, at an elevation of 10000 feet at timber line, growing in open gravelly and stony places near clumps of stunted *Pinus albicaulis*. It is abundant near the middle part of the basin between Mt. Rose proper and the ridge to the north, and last summer was found extending up the slope of "North Peak" to an elevation of about 10400 feet, forming great patches of blue, occurring in formation other than granite, although at one place near its lower limit a few plants were found that had established themselves in the granite, but at a distance of only a few feet across the line.

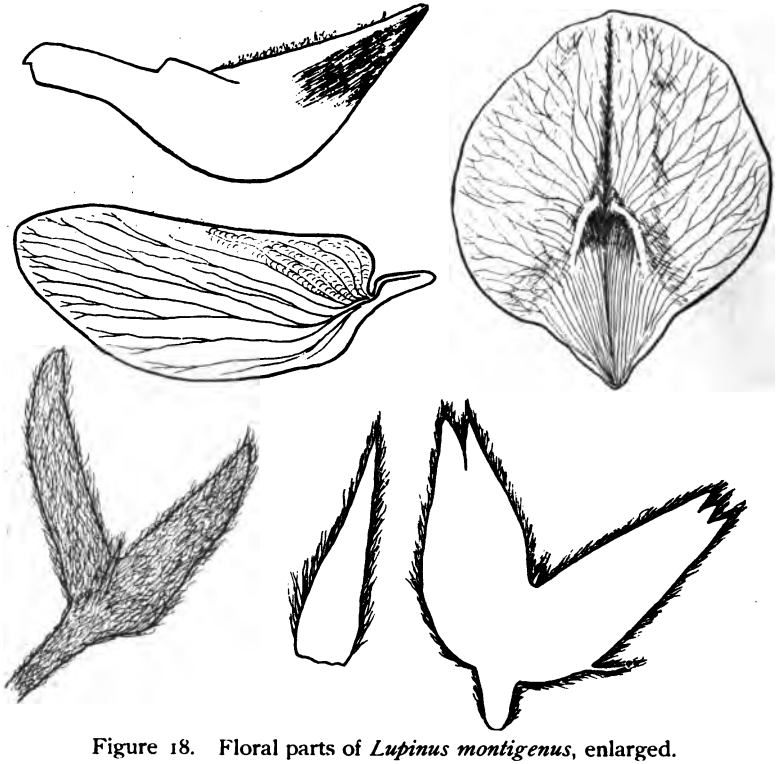

Figure 18. Floral parts of *Lupinus montigenus*, enlarged.

On the steep west slope of Mt. Rose it is scattered through the forest of alpine white pine, ranging from somewhat over

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10000 feet well down into the granite to as low as 9000 feet or perhaps lower.

In the matter of pubescence this species resembles *L. nevadensis*, being equally white, but the hairs are less spreading. While the leaves are practically the same, the basal ones are but little developed, and the flowers are totally different, as may be noted by comparing the descriptions and illustrations of the two species. I am also indebted to Miss Eastwood for comparison of this species with the material in the Gray Herbarium.

LUPINUS MEIONANTHUS Gray, Proc. Am. Acad. **6**: 522. 1868.

"Undique sericeo-incanus; caulibus ut videtur herbaceis vel suffruticosis adscendentibus e radice perenni; foliolis 6-9 concoloribus oblanceolatis obtusis; stipulis parvis setaceis; bracteis calyce brevioribus; floribus minimis (vix lineas 3 longis) verticillatis in racemum spiciformem congestis; calyce pedicello longiori ebracteolato, labiis fere integris corollam glabram subaequantibus; carina apice brevi late obtuso inflexa ciliata, leguminibus ovatis incanis 1-2-spermis.—Nevada, near Carson City, Dr. C. L. Anderson. It would be unsafe to describe a new Lupine before the old species are settled, except in a case like this, —a silvery-canescent species with remarkably small flowers. These are blue or purple, with a yellow spot on the vexillum. Leaflets 6-11 lines long, mostly equalling the petiole. Legumes half an inch long. Seed with a small hilum."

Gray was evidently somewhat in doubt about the character of the stems of this species. One could not well say that they are suffruticose at the base, but they are firm-herbaceous The white silvery leaflets are 2 cm. long, 5 mm. wide, the midvein rather prominent beneath and produced at the blunt apex of the leaf into a very short mucro. The peduncles are short, about 3 cm. long, while the inflorescence is occasionally 1 dm. long, the flowers more or less whorled, at first often crowded, but at length becoming lax. The fugaceous bracts are ovate-lanceolate, 2.5 mm. long, 1.5 mm. wide at base. The calyx is 5 mm. long, the upper lobe 3 mm. long, shallowly notched, the lower lobe 4 mm. long, obscurely 3-toothed. The flowers are com-

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monly lilac-purple, sometimes darker, 6 mm. long, 5 mm. deep, the apices of banner and wings only 1 mm. apart. The banner has a yellow spot, as described, its sides turned back, the edges almost meeting, the face narrow with a deep groove, nearly concealed by the wings. The wings are broadly inflated, deeply and shallowly furrowed along the lower half of the upper edge where they fit into the groove of the banner. The slightly protruding keel is curved almost at right angles, sparingly short pubescent toward the stout and bluntly pointed apex, 2.5 mm. deep at the middle.

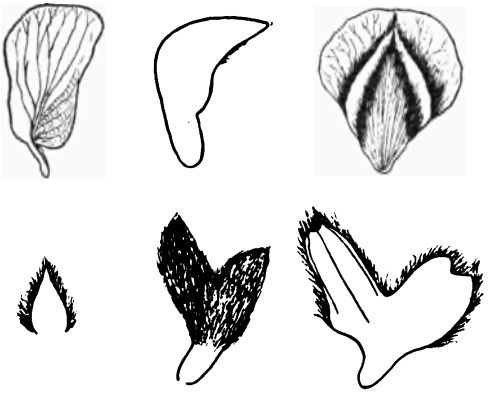

Figure 19. Floral parts of *Lupinus meionanthus*, enlarged.

The above notes, the cover illustration, and the drawings of the floral parts were taken from my no. 9773, collected in coarse granite sand on forest slopes back of Franktown, which is in the type region, only a few miles north of Carson. It is rather common in the Sierra Nevada in both Nevada and adjacent California, and on Mt. Rose ascends to an elevation of 9700 or 9800 feet, and is apparently restricted to granite, growing in clumps. The following specimens from Nevada are in the Station herbarium:

WASHOE COUNTY: Franktown, *Heller 9773;* Black's canyon near Mt. Rose, *Kennedy 685.*

So far I have found nothing answering to the description of *L. meionanthus* var. (?) *heteranthus* Wats. Bot. King Rep. 56. 1871, described as having "flowers somewhat larger, with the

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calyx gibbous or even spurred at base, and the lobes more elongated; legumes oblong, 3-5-seeded. Of exactly the habit of the last, with stems 1 foot high, the raceme nearly sessile, and scarcely exceeding the leaves. Collected by Anderson (92 and 232) and also by Dr. Torrey (88) in the same region with the last, near Carson City."

If any dependence can be placed upon the character "racemes nearly sessile, and scarcely exceeding the leaves," this should be a well marked plant. In the Bibliographical Index he refers it to *L. holosericeus* Nutt. the type of which was collected on "islands and gravelly banks of the Wahlamet" not far from Portland, Oregon, by Nuttall. This is described as closely related to the Californian *L. albifrons*, but with "flowers about half the size." It is probably not found in Nevada.

THE SOUTHERN CALIFORNIA JUNCACEAE—I

By S. B. Parish

The material available for a study of the rushes of southern California is less abundant than is desirable. Besides my own collection I have had, through the kindness respectively of Dr. H. M. Hall and Professor LeRoy Abrams, the opportunity of examining the Juncaceae in the herbaria of the University of California and of Stanford University. Mr. F. V. Coville has compared a few critical specimens with the material in the National Herbarium. To Mrs. Charlotte M. Wilder I am under grateful obligations for the drawings, made from fresh material, illustrating *Juncus rugulosus*.

JUNCACEAE

A family of six localized genera of only one to three species each, and the two following which are large and widely distributed.

Key to the North American Genera

Plants more or less hairy; leaf sheaths closed; capsule 1-celled, 3-seeded — 1. Luzula

Plants smooth; leaf sheaths open; capsule mostly 3-celled, many-seeded — 2. Juncus

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1. LUZULA DC.

LUZULA DC. in Lam. & DC. Fl. Franc. **1**: 198. 1805. *Cyperella* Kramer, Tent. Bot. 41. 1744. *Juncoides* Sabbati, Syn. Pl. Roma 23. 1745. *Juncodes* Sheldon, Minn. Bot. Studies **1**: 62. 1894.

More than 60 species, widely distributed, only the following known from our region:

Perianth at most equaling the capsule; seed with a long white appendage	L. comosa
Perianth exceeding the capsule: appendage short	L. comosa macrantha

LUZULA COMOSA E. Mey. Synop. Luzul. 21. 1823. *Juncodes comosum* Sheldon, l. c. 64.

Common by streams and in meadows in the Nevadan region at 4000 to 9000 feet altitude.

Round Valley, San Jacinto mountains, July, 1909, *Mrs. C. M. Wilder 921*. Head of Bear creek, San Bernardino mountains, August, 1882, *Parish 1437*.

LUZULA COMOSA E. Mey. var. MACRANTHA Wats. Bot. Cal. **2**: 203. 1880. *Juncoides comosum* var. *macranthum* Parish, Erythea **3**: 59. 1895.

San Bernardino mountains, 5000-7400 feet altitude: Seeley's Flat, June, 1892, *Parish 2472*. Bluff Lake, June, 1894, *Parish 3263*.

2. JUNCUS Linn.

JUNCUS Linn. Gen. Pl. 104. 1737.

Over 200 species are recognized, of world wide distribution, mostly in wet or damp soils.

KEY TO THE SOUTHERN CALIFORNIA JUNCI

A. Flowers solitary, each subtended by 2 bracteoles, and borne on a pedicel which is 1-bracted at base	*Prophyllati.*
Annual; stems slender and branched	
Perianth segments linear-lanceolate, exceeding the capsule; seeds ovoid, apiculate	1. J. bufonius
Inner segments obtuse, little if at all exceeding the capsule; seeds truncate	1a. J. bufonius halophilus

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Perennial
- Stems leafy at base; leaves linear, shorter than the stems
  - Leaves flattened, their sheaths auriculate; flowers numerous — 2. J. interior
  - Leaves terete; flowers 1-5, one subsessile, the others pedicellate — 6. J. Parryi
- Stems scapiform; basal sheaths always bladeless
  - Stamens 3; capsule trigonus-obovoid — 5. J. effusns
  - Stamens 6
    - Subepidermal fascicles present; stems therefore sulcate
      - Perianth segments 4-5 mm. long, convergent about the prismatic acute capsule — 3. J. textilis
      - Perianth segments 3 mm. long, acute, divergent about the subglobose capsule — 4. J. patens
    - Subepidermal fascicles absent; stems smooth or finely striate
      - Stems with medulla; perianth 3-4 mm. long — 7. J. balticus
      - Stems mostly fistulous; perianth 5-6mm. long — 8. J. Lesueurii
- Stems scapiform, often more or less compressed, the uppermost basal sheath mostly bearing a scapiform blade — 7a. J. balticus mexicanus

B. Flowers bracteate only at the base of the short pedicel. *Eprophyllati*

Perennial
- Lowest floral bract apparently continuous with the stem; inflorescence pseudo-lateral
  - Capsule trigonus-subglobose — 9. J. acutus sphaerocarpus
  - Capsule trigonus-ovate — 10. J. Cooperi
- Inflorescence manifestly terminal
  - Leaves septate
    - Leaves ensiform, the edges toward the compressed stem
      - Stems wingless; styles long-exsert — 12. J. phaeocephalus panic-
      - Stems narrowly winged; inflorescence anthelate — [ulatus
        - Heads discrete; styles long — 11. J. oxymeris
        - Heads numerous, more condensed; styles short — 13. J. xiphioides
    - Leaves terete, fistulous, completely septate
      - Heads conglomerate, densely 30-80-flowered — 14. J. Torreyi
      - Heads small, discrete, 6-10-flowered
        - Stems smooth, or finely striate — 17. J. dubius
        - Stems and leaves transversely rugose — 18. J. rugulosus
    - Leaves gramineous, obscurely septate
      - Inflorescence a single terminal, 10-20-flowered head — 15. J. Mertensianus

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Inflorescence of several discrete, 6-10-flowered heads	16. J. nevadensis
Leaves gramineous, without septa	
Ligules hyaline-auriculate, perianth stramineous, 5 mm. long	19. J. canaliculatus
Auricles wanting, or inconspicuous	
Perianth 6 mm. long, its segments equal, acute, exceeding the narrow capsule; anthers 2 mm. long, subsessile	20. J. latifolius
Perianth 4 mm. long, its segments obtuse, the outer pair apiculate, the inner hyaline, shorter than the obtuse apiculate capsule; anthers .75 mm. long on filaments of the same length	21. J. obtusatus
Annual; stems 1-2 cm. tall, 1-3-flowered	22. J, triformis uniflorus

I. Prophyllati

§1. *Junci poiophylli*

1. Juncus bufonius Linn. Sp. Pl. 328. 1753.

Very common throughout the Cismontane region, ascending the mountains to 7400 feet altitude, and reaching at least the borders of the desert.

Los Angeles county. Los Angeles, April, 1903, *Braunton 876.* Rock creek, desert slope San Gabriel mountains, 3800 feet altitude, July, 1908, *Abrams and McGregor 561.* Santa Catalina island, according to Lyon, Bot. Gaz. **11:** 334.

San Bernardino county. San Bernardino Valley, Seeley's Flat, Bear Valley, Bluff Lake, and Morengo, *Parish.*

Riverside county. Elsinore, May, 1901, *Mrs. J. D. Abrams.* Strawberry Valley, San Jacinto mountains, 4600 feet altitude, June, 1901, *Hall 2076.*

Orange county. Santiago creek, *Helen D. Geis 562.*

San Diego county. Mission Valley, Ramona, *Brandegee.* San Miguel mountains, May, 1904, *Chandler 5240.* Cuyamaca Lake, June, 1903, *Abrams 3847.*

Ventura county. Sespe creek, June, 1908, *Abrams and McGregor 178.*

Santa Barbara county. Nordhoff, April, 1897, *Hubby 108.*

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1a. JUNCUS BUFONIUS Linn. var. HALOPHILUS Fernald & Buchenau, Rhodora **6**: 39. 1904.

Stems numerous, comparatively stout, but short, and equaled or exceeded by the leaves: terminal flowers 1-2; petals obtuse, shorter than the sepals, not much or at all exceeding the capsule: seed abruptly truncate at top. Santa Cruz island, 1888, *Brandegee.* The specimen is in the herbarium of Stanford University, and is the first collection made on the Pacific coast.

2. JUNCUS INTERIOR Wiegand, Bull. Torr. Club **27**: 516. 1900. *J. arizonicus* Wiegand, l. c. 517. *J. tenuis* Willd. var. *congestus* Engelm. Trans. St. Louis Acad. **2**: 452. 1868, in part.

Our specimens have shorter capsules than are assigned to *J. interior* by its author, and smaller flowers and slenderer stems than typical *J. arizonicus.* These, and perhaps *J. neo-mexicanus* are probably confluent, and might advantageously be united in a species of more comprehensive definition.

In meadows in the San Bernardino mountains at about 5000 feet altitude. Little Bear Valley, August, 1884, *Parish 1665* in part. Prairie Flat, June, 1895, *Parish 3956.*

§2. *Junci genuini*

3. JUNCUS TEXTILIS Buchenau, Abh. Nat. Ver. Brem. **17**: 336. *pl. 6.* 1902. *J. Lesueurii* Bolander, var. *elatus* Wats. Bot. Cal. **2**: 205. 1880.

Seldom abundant; in moderately damp soil, in canyons, from near the coast to the foot of the San Bernardino mountains.

Oxnard, 1901, *Davy 7538.* San Fernando Mission, June, 1887, *Parish 1937.* Alamitos, June, 1901, *Abrams 1753.* Monrovia, 1907, *Dudley.* Fallbrook, November, 1891, *Parish.* Arrowhead Hot Springs, 1750 feet altitude, May, 1906, *Grant 6650.* Waterman canyon, San Bernardino mountains, 1500 feet altitude, May 20, 1910, *Parish 8012.*

4. JUNCUS PATENS E. Mey. Synop. Luzul. 28. 1823.

Santa Monica Range, July, 1890, and June, 1908, *Hasse.* The southern limit of the species.

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5. JUNCUS EFFUSUS Linn. Sp. Pl. 325. 1753.

Growing in robust clumps, in marshy ground, and on the borders of streams, in the Cismontane region, and ascending the mountains to 5500 feet altitude.

San Bernardino Valley, *Parish.* Fredalba Park, San Bernardino mountains, *Miss Pettibone*, and *Abrams 2797.* Strawberry peak, San Bernardino mountains, July, 1901, *Abrams 1999.* Strawberry Valley, San Jacinto mountains, July, 1901, *Hall 2360.* Cuyamaca mountains, July, 1875, *Palmer.* Santa Ysabel, June, 1903, *Abrams 3783.*

6. JUNCUS PARRYI Engelm. Trans. St. Louis Acad. **2**: 447. 1866.

Summit of San Gorgonio (Grayback) peak, 11485 feet altitude, August, 1905, *Mrs. C. M. Wilder.* The southern limit of the species in the Sierra Nevada.

7. JUNCUS BALTICUS Willd. Berlin Mag. **3**: 298. 1809.

An exceedingly variable species, of which a number of varieties have been described, and to these several proposed species have been reduced, among them *J. mexicanus* Willd. This is defined as having strongly compressed and usually contorted stems, and scape-like leaf-blades more or less constantly produced from the uppermost basal sheaths. These characters, uncertain of themselves, do not stand the test of field study. There are leafless plants with stems either compressed or terete, and the same is the case with others which have leaves. Again, the same rootstock may produce both terete and compressed stems, which may have cataphyl'a either blade-bearing or muticous. Leafless plants are usually more abundant than leafy ones, but commonly both forms may be found together. In studying an area covered with these two forms, growing thus intermingled, it is difficult to consider them as even valid varieties. But in default of any satisfactory treatment of the species as a whole, and the most recent, that of Buchenau in Das Pflanzenreich certainly cannot be so considered, it seems best to keep up, in a paper such as this, the distinction, artificial as it is. I have, therefore, referred to the species such specimens as are entirely

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without blade-bearing cataphylla, while those having at least some cataphylla with blades are separated, but only with the rank of a form. They all affect soils which are damp, or even wet in winter, but which may, or may not, become dry in summer. They are common throughout the Cismontane region, ascend the mountains to 7000 feet altitude, and are found in permanently damp places in the deserts.

Inyo county. Furnace creek, June, 1891, *Coville and Funston 226.*

Ventura county. Mt. Pinos, 5200 feet altitude, June, 1905, *Hall 6412.* Potrero San Emigdio, June, 1905, *Hall 6372.* Bitter creek, 1800 feet altitude, July, 1905, *Hall 6569.*

Los Angeles county. Los Angeles river, April, 1901, *Abrams 1445;* September, 1902, *Braunton 666.*

San Bernardino county. San Bernardino Valley, June, 1908, *Parish 6949.* Bloomington, May, 1891, *Parish 4727.* Bear Valley, 6500 feet altitude, *Parish 1458.* Upper Santa Ana, 6700 feet altitude, July, 1906, *Hall 7547.* Big Meadows, 6800 feet altitude, *Hall 7575.*

Riverside county. Elsinore, May, 1901, *Mrs. J. D. Abrams.*

7a. JUNCUS BALTICUS Willd. forma **mexicanus** (Willd.) comb. nov. *J. balticus* Willd. var. *mexicanus* Kuntze, Rev. Gen. **2**: part 3, 320. 1898. *J. mexicanus* Willd. in R. & S. Linn. Syst. Veg. VII. ed. 16. **1**: 178. 1829. *J. compressus* H. B. K. Nov. Gen. et Sp. **1**: 235. 1815.

Some or all of the uppermost basal sheaths bearing a scapiform blade.

Ventura county. Sespe, 2500 feet altitude, June, 1908, *Abrams and McGregor 180.*

Inyo county. Haiwee meadows, 3800 feet altitude, June, 1906, *Hall and Chandler 7351.* Seymour meadows, 5800 feet altitude, *Hall 6626.*

San Bernardino county. San Bernardino valley, May, 1901, May, 1906, *Parish 4727, 6945.* Mill creek, June, 1881, *Parish 990.* Mojave desert, *Pringle.* Newberry, Mojave desert, May, 1906, *Hall 6122.*

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Riverside county. San Jacinto mountains: Thomas valley, 4500 feet altitude, *Hall 2031;* Fuller's Mill, 5800 feet altitude, *Hall 2249.*

San Diego county. Sweetwater dam, *Alderson.* Jamaicha, 400 feet altitude, May, 1907, *Chandler 5260.*

8. JUNCUS LESUEURII Bolander, Proc. Cal. Acad. **2:** 179. 1863.

Stems 80 to 200 cm. tall, 4 to 6 mm. in diameter, fistulous, or the lower half sometimes pithy: cataphylla stramineous, long and lax: floral bracts 6 to 15 cm. long, pungent: inflorescence many flowered.

Wash of Lytle creek, near San Bernardino, June, 1910, *Parish 8013.* The southern limit of the species.

II. EPROPHYLLATI

§3. *Thalassi*

9. JUNCUS ACUTUS Linn. var. SPHAEROCARPUS Engelm. Rep. U. S. Geol. Surv. W. 100th Merid. **6:** 376. 1878. *J. robustus* Wats. Proc. Am. Acad. **14:** 302. 1879.

Growing in robust clumps on the borders of tidal marshes near the seacoast, and by streams at low altitudes in the Colorado desert.

Gaviota, May, 1902, *Elmer 3015.* Oxnard, June, 1891, *Davy 7886.* Ballona, May, 1901, *Abrams 682; Braunton 702.* Wilmington, October, 1882, *Parish 657.* Santa Catalina island, May, 1890, *Brandegee.* Oceanside, June, 1897, *Parish 4450.* San Diego, October, 1903, *Chandler 400.* Sweetwater dam, June, 1895, *Alderson 954.* Tia Juana river, August, 1902, *A. C. Herre;* May, 1903, *Abrams 3501.* Thence into Lower California: San Janico, 1897, *Anthony 419.* Colorado desert: Palm canyon, Palm Springs, altitude 600 feet, April, 1907, *Parish 6146;* Chuckwalla Springs, May, 1905, *Hall 5778.*

10. JUNCUS COOPERI Engelm. Trans. St. Louis Acad. **2:** 590. 1868.

Borders of saline marshes in the desert region.

Bennett Wells, Mojave desert, June, 1891, *Coville and Funston 204.* Carrizo creek, Colorado desert, April, 1905, *Brandegee.*

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A new edition of the Catalog of North American Plants is in preparation. Thus far 116 pages have been printed, and other parts will follow as fast as possible. In all there will be about 300 pages. Since a considerable time must elapse before the work can be completed, the 116 pages and other parts as soon as issued, will be sent to those who wish to have them in that form, for $1.25, payment to be sent with the order.

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MUHLENBERGIA

NOVEMBER, 1910

Editors: A. A. HELLER and P. BEVERIDGE KENNEDY

The Limber Pine (*Pinus flexilis* James)

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Volume 6 December 31, 1910

MUHLENBERGIA

THE SOUTHERN CALIFORNIA JUNCACEAE—II

By S. B. Parish

§4. *Junci septati*

11. Juncus oxymeris Engelm. Trans. St. Louis Acad. 2: 483. 1868.

In the Nevadan region at about 6000 feet altitude.

San Bernardino mountains: Deep creek, July, 1901, *Abrams 2026;* Strawberry Peak, July, 1901, *Abrams 1997.* San Jacinto mountains: Strawberry valley, August, 1897, *Hall 837, 856.*

12. Juncus phaeocephalus var. paniculatus Engelm. Trans. St. Louis Acad. 2: 484. 1868.

Very common throughout the Cismontane region, and ascending the mountains to 9400 feet altitude.

Inyo county. Owens valley, June, 1891, *Coville and Funston 901.*

Los Angeles county. Los Angeles, *Davidson.* Santa Monica, *Hasse.*

Orange county. Alamitos, June, 1901, *Abrams 1752.*

San Bernardino county. San Bernardino valley, 1000 feet altitude, May, 1910, *Parish 8011.* Devil canyon, 2000 feet altitude, May, 1909, *Parish 7096.* Whitewater basin, August, 1909, *Mrs. Wilder.* Big Meadows, 6800 feet altitude, July, 1906, *Hall 7596.* South fork Santa Ana river, 8200 feet altitude, *Hall 7609.*

Riverside county. San Jacinto mountains: Fuller's Mill, 5800 feet altitude, *Hall 2258;* Snow creek, 5800 feet altitude, July, 1901, *Hall 2543;* eastern slope San Jacinto Peak, 9400 feet altitude, *Reed 2502.*

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San Diego county. Sweetwater dam, June, 1895, *Alderson*, Cameron's ranch, Laguna, June, 1904, *Mearns 3677.*

The var. *glomeratus* Engelm. l. c. has been reported from our region, but I have seen no authentic specimens. It may be recognized by its condensed inflorescence of one to three capitate glomerules.

13. JUNCUS XIPHIOIDES E. Mey. Synop. Junc. 50. 1822.

Common on stream and marsh borders throughout the Cismontane region, ascending the mountains to 8300 feet altitude, and reaching their desert bases.

Inyo county. Panamint mountains: Surprise canyon, 2300 feet attitude, April, 1891, *Coville and Funston 710;* Pleasant canyon, 2500 feet altitude, May, 1906, *Hall and Chandler 6909.*

Ventura county. Mt. Pinos, 8300 feet altitude, *Hall.*

Los Angeles county. Los Angeles, *Davidson.*

Orange county. Santa Ana peat lands, May, 1902, *Helen D. Geis.*

San Bernardino county. San Bernardino valley, 1000 feet altitude, June, 1908, *Parish 6948, 6964.* Bear valley, San Bernardino mountains, 6500 feet altitude, June, 1894, *Parish 3257.* Cushenberry Spring, Mojave desert, 4000 feet altitude, June, 1901, *Parish 4954.* Colorado desert: Big Morongo, June, 1894, *Parish 3250;* Whitewater, June, 1894, *Parish 3253.*

Riverside county. Andreas canyon, Colorado desert, March, 1881, *Parish 710.*

San Diego county. Warner's ranch, *Parish.* San Luis Rey river, June, 1897, *Parish.*

14. JUNCUS TORREYI Coville, Bull. Torr. Club **22:** 303. 1895.

J. nodosus Linn. var. *megacephalus* Torr. Fl. N. Y. **2:** 326. 1843, in part.

Occasional by the borders of marshes in the Cismontane region.

Los Angeles river, July, 1902, *Braunton 559.* Santa Ana peat lands, 1902, *Helen D. Geis*, Orange, October, 1882, *Parish 1593.* San Bernardino, August, 1909, *Parish 7153.*

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15. JUNCUS MERTENSIANUS Bong. Mem. St. Petersb. VI. **2**: 167. 1832.

In a marsh at 6000 feet altitude, Mill creek, San Bernardino mountains, July, 1892, *Parish 2522*. Stream bank above Round Valley, San Jacinto mountains, July, 1909, *Mrs. C. M. Wilder 924*.

A northern species which finds its southern limit at the last named station.

16. JUNCUS NEVADENSIS Wats. Proc. Am. Acad. **14**: 303. 1879.

Common in meadows in the San Bernardino mountains at 5000 to 7500 feet altitude.

Seeley's Flat, June, 1892, *Parish 2312*. Little Bear Valley, August, 1884, *Parish 1665*. Bear Valley, August, 1882, June, 1894, June, 1895, *Parish 1439, 3255, 3788*. Bluff Lake, June, 1894, *Parish 3256*.

J. aseptus is an herbarium name given by Dr. Engelmann to my no. 1439, and most of my collections were distributed under it. Buchenau, in Das Pflanzenreich (IV. **36**: 202), considers it a form of *J. Suksdorfii* Rydb. Bull. Torr. Club **26**: 541. But that is a larger flowered plant, and our specimens are better referred to *J. nevadensis*, from which they differ only in the somewhat deeper color of the flowers and the narrower leaves.

17. JUNCUS DUBIUS Engelm. Trans. St. Louis Acad. **2**: 459. 1868.

Apparently very rare in our region.

Witch creek, San Diego county, *Alderson 365*. Cuyamaca mountains, *Palmer 384*, according to Watson, Bot. Cal. **2**: 209.

18. JUNCUS RUGULOSUS Engelm. Bot. Gaz. **6**: 224. 1881.

Common by streams and marshes throughout the Cismontane region, and ascending the mountains to 3500 feet altitude.

Los Angeles river, July, 1902, *Braunton 589*. Pasadena, *McClatchie*. San Bernardino Valley, September, 1907, *Parish 6444*. Lone Pine canyon, Cucamunga mountains, July, 1908, *Abrams and McGregor 688*. Glen ranch, upper Lytle creek, July, 1902, *Abrams 2732*. Balona ranch, San Diego county,

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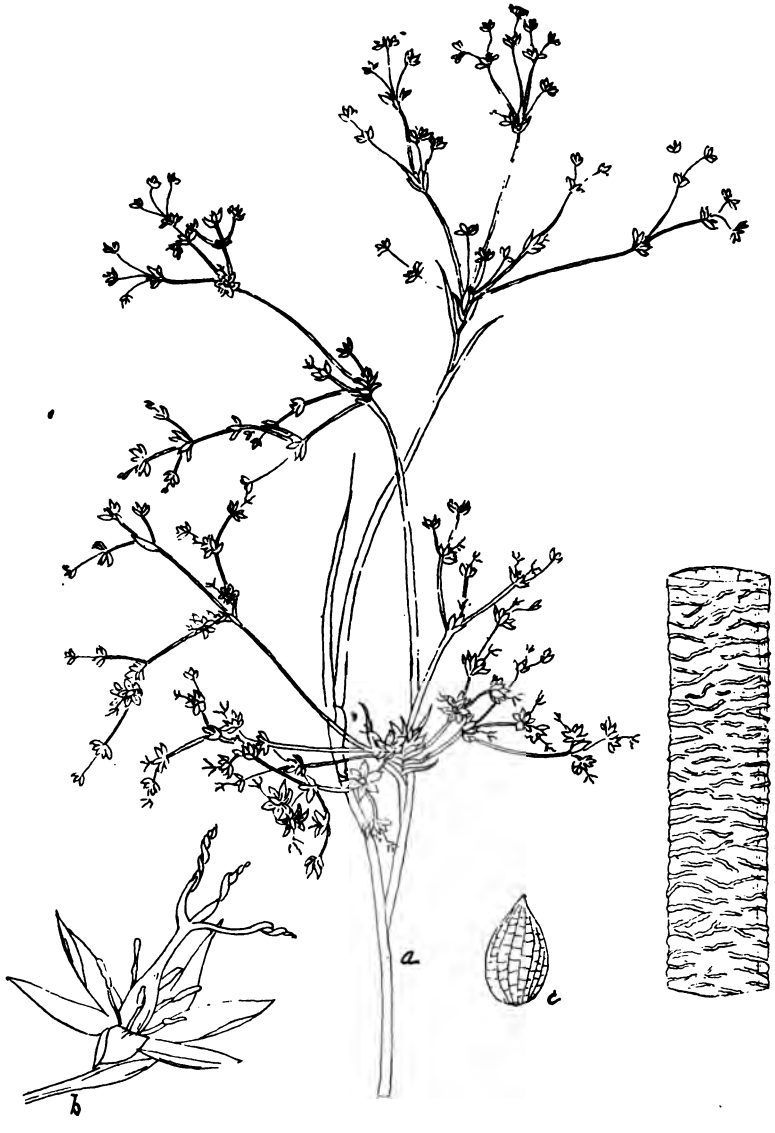
Plate 5



a. Inflorescence, a little less than natural size. b. Flower x 10. c. Mature seed x 60. Unlettered figure. Epidermis of stem x 10.

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June, 1882, *Parish 1419.* Oroflame canyon, Cuyamaca mountains, June, 1903, *Abrams 3928.*—Plate 5.

The late Dr. Buchenau (Das Pflanzenreich IV. **36:** 205) included this in *J. dubius* as "a morbid state." Study of living plants does not sustain this disposition. They present no indications whatever of disease. Among many hundreds of plants examined not one was found in which the epidermis was not regularly rugose throughout, and it is so, moreover, from the very begining of growth. A universal and constant character, such as this, is natural, and not morbific.

§5. *Junci graminifolii.*

19. JUNCUS CANALICULATUS Engelm. Bot. Gaz. **7:** 6. 1882. *J. macrophyllus* Coville, in Hall, Univ. Cal. Publ. Bot. **1:** 65. 1902.

Rather common in moderately damp soil in canyons, notably on stony stream banks, throughout the foothills of the Cismontane region, ascending the mountains to 7500 feet altitude, and descending the desert slope of the San Bernardino mountains to 3000 feet altitude.

Los Angeles county. Claremont, September, 1903, *C. F. Baker 3695.* Strains Camp, July, 1901, *Abrams 1895.* Rock creek, desert slope San Gabriel mountains, July, 1908, *Abrams and McGregor 562.*

San Bernardino county. Twin creek, 3000 feet altitude, September, 1895, *Parish 5164.* Mill creek canyon, 4000 feet altitude, August 26, 1881, *Parish 1095* (type); June, 1901, *Parish 5029.* Little Bear Valley, 5400 feet altitude, August, 1884, *Parish 1415a.* Deep creek, 5000 feet altitude, July, 1901, *Abrams 2027.* Bear Valley, 6500 feet altitude, August, 1882, *Parish.* San Gorgonio mountain, *Grant.* Holcomb Valley, 7500 feet altitude, *Parish 1439a.* Cushenberry canyon, borders of Mojave desert, August, 1882, *Parish 1439b.*

Riverside county. San Jacinto mountains: Snow creek, 5000 feet altitude, July, 1901, *Hall 2536;* Strawberry Valley, 5000 feet altitude, July, 1901, *Hall 2522.*

San Diego county. Witch creek, *Alderson 365.* Balona ranch, June, 1882, *Parish 1415.*

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Most of our plants were formerly referred to *J. longistylis* Engelm., a species now believed not to reach our region.

20. JUNCUS LATIFOLIUS Buchenau, Monog. Junc. 425. 1890. *J. orthophyllus* Coville, Cont. U. S. Nat. Herb. **4**: 207. 1893.

Caespitose in wet meadows and by stream banks at high altitudes in the San Bernardino mountains.

Bear Valley, 6500 feet altitude, June, 1894, *Parish 3258;* August, 1891, *Abrams.* Bluff Lake, 7400 feet altitude, June, 1894, *Parish 3259, 3260.*

Our specimens belong to the var. *genuinus* Buchenau, Das Pflanzenreich IV. **36**: 246, which is distinguished by its stature, not exceeding 25 cm., and its 2 to 6 heads, which are 8 to 10-flowered. The var. *paniculatus* Buchenau, l. c., 50 cm. or more tall, with narrower (2 mm.) leaves, and numerous paniculate heads, may be expected.

21. JUNCUS OBTUSATUS Engelm. Trans. St. Louis Acad. **2**: 495. 1868.

San Bernardino mountains at about 5000 feet altitude.

Wet sandbar, Tyler's mill, August, 1881, *Parish 1089.* Little Bear Valley, May, 1884, *Parish 1089a.* In the same neighborhood, July, 1901, *Abrams 1998.*

This is the southern known limit of the species.

22. JUNCUS TRIFORMIS var. UNIFLORUS Engelm. Trans. St. Louis Acad. **2**: 493. 1868.

On wet sandbars, Bear Valley, 6500 feet altitude, San Bernardino mountains, June, 1886, *Parish 1859.* Margin of Lake Surprise, 9000 feet altitude, San Jacinto mountains, July, 1908, *Reed 2481.* The latter station is the southern known limit of the species.

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Regional and Geographical Distribution of the Southern California Juncaceae

	Local dist.			Extension			General distribution
	Cismontane	Nevadan	Desert	North	East	South	
Luzula comosa		x		x			Mts. Pacific coast
var. macrantha		x		x			Mts. Pacific coast
Juncus bufonius	x	x	x	x	x	x	Cosmopolitan
var. halophilus	x						New England, Sicily
J. interior		x		x	x	x	North America
J. textilis	x						Southern California
J. patens	x			x			Pacific coast
J. effusus	x	x		x	x	x	Cosmopolitan
J. Parryi		x		x	x		Mts. Pac. coast, R'y mts.
J. balticus	x	x	x	x	x	x	Amer., north. Eu., Japan
f. mexicanus	x	x	x	x	x	x	American
J. Lesueurii	x			x		x	Pacific coast, S. America
J. acutus var.	x		x	x		x	California, Lower Cal.
J. Cooperi			x		x		S. California, Nevada
J. oxymeris		x		x			Mts. Pacific coast
J. phaeocephalus var.	x	x		x			Pacific coast
J. xiphioides	x	x	x	x		x	Pacific coast
J. Torreyi	x			x	x	x	North America
J. Mertensianus		x		x	x		Mts. Pacific coast, R. mts.
J. nevadensis		x		x			Mts. Pacific coast
J. dubius	x			x			Pacific coast
J. rugulosus	x	x					Southern California
J. latifolius		x		x			Mts. Pacific coast
J. canaliculatus	x	x	x	x		x	S. Cal., Ariz., L. Cal.
J. obtusus		x		x			Mts. Pacific coast
J. triformis var.		x		x			Mts. Pacific coast
	15	18	7	22	9	10	

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Of the species and varieties listed above, ten belong in the Nevadan region, six in the Cismontane, one in the Desert; three occur in both the Cismontane and the Nevadan, one in both Cismontane and Desert, while five are found in all these regions. There are two species which are restricted to North America, where they have an extensive distribution, two others reach South America, one reaches Europe and one Japan, not including the two species which may be counted as cosmopolitan. Nearly two-thirds of the whole number, namely 16, are confined to the Pacific coast of North America, and of these, two are endemic to southern California, while two other extend but a short distance beyond its boundaries.

San Bernardino, California.

THE LIMBER PINE

By A. A. Heller

Pinus flexilis James, Long Exped. **2**: 35. 1823.

Apinus flexilis Rydb. Bull. Torr. Club **32**: 598. 1905.

Discovered nearly a century ago by Dr. James, a member of one of the pioneer expeditions to the then almost unknown far west, this species of pine is still a rarity in collections, due, no doubt, to the fact that it inhabits high ranges not much frequented by persons interested in the study of trees. The original account gives its habitat as "arid plains subjacent to the Rocky Mountains, and . . up their sides to the region of perpetual frost."

At first I was inclined to follow Dr. Rydberg in his treatment of this species, but field observation has changed my opinion. There is nothing about the appearance of the tree, either in growth, bark, leaf or cone to separate it from *Pinus* proper. The seeds are wingless, and this character it has in common with the nut pines, which Dr. Small has separated under the name *Caryopitys*. The scale tips are without prickles, but are not as much thickened as in some other species unhesitatingly referred to *Pinus*.

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I use the expression "wingless seed" for the reason that it much better describes the actual character than does "rudimentary wing" or "vestige of a wing." I have examined numerous cones of *Pinus albicaulis*, and more recently those of the species under discussion, and have failed to find the trace of a wing on any of the seeds. The seed is simply imbedded in a cavity at the base of the scale, which cavity may or may not have a thin raised edge. This thin raised edge when present is apparently by courtesy termed the "wing," but I do not see how it has any claim to that title, for it is not part of the seed, but a part of the scale and remains affixed to it.

I first saw *P. flexilis* in 1908 on the Clover mountains, as the northern part of the Ruby mountains in eastern Nevada is called. The cover illustration is taken from a clump of trees at timber line, the altitude about 10000 feet, and shows the low decumbent growth caused by high altitude and the snows of winter. The tree is fairly common on the Clover mountains at altitudes of 9000 to 10000 feet, but ranging somewhat higher as well as lower under favorable conditions. It attains its greatest size, thirty to fifty feet, with a trunk diameter of a foot to a foot and a half, on cool north slopes or in ravines at the upper end of canyons where snow lies late in summer. On a ridge east of Lamoille there is a fairly dense stand of large trees, and doubtless there are similar groves in the surrounding rugged country, but as a rule it occurs as scattered individuals not frequent enough to impart the dark hue common to timbered ridges. The name for it in the region is white pine.

Engelmann, in Trans. St. Louis Acad. **2**: 208. 1863, writes as follows concerning this species:

"On the Rocky Mountains, from New Mexico to the 49th parallel, 'occupying the subalpine belt, never forming entire forests, in the lower elevations associated with *P. contorta*, approaching the alpine districts, scattering with *P. aristata*' (Parry's Notes)."

"*P. flexilis*, the American representative of *P. Cembra* of the Old World, is a middle-sized tree, usually 30-50 feet high, though Fendler, a good authority, saw it near Santa Fe 60-80

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feet high. . . . In Colorado it is a fine tree, with tapering trunk and oval outline, branching almo t from the base, lower branches horizontal, upper ones ascending; wood white, hard, annual rings from one-eighth to ½ line, on an average ¼ line wide; trees becoming in 250-300 years about 1 foot thick. Leaves crowded towards the ends of the very flexible branches, persistent 5 or 6 years, usually 1 ½-2 ½, very rarely 1 to 3 inches long; sheaths similar to those of *P. Strobus* or *P. Cembra*, 8 lines long, deciduous. Male aments 4-5 lines long, forming a thick spike 10-12 lines long, cones subcylindric, tapering to the end, 4-5 inches long, 2 inches in the largest diameter, on short peduncles; scales 12-14 lines long, 10-12 lines wide, squarrose; lowest sterile ones recurved; fertile ones with deep impressions for the reception of the seeds both on the upper inner side and on the back, the latter cavities partly formed by the large (4-6 lines long) ligneous or rather corky bract. Seeds 4-5, rarely 6 lines long, irregularly ovate or obovate; wing minute, not deciduous nor adhering to the scale, as in *P. Cembra*, *P. edulis*, etc., but reduced to a persistent keel on the upper end and outer edge of the seed; embryo with 8 or rarely 9 cotyledons."

In Amer. Journ. Sci. and Arts II. **34**: 332, he further states that "the large seeds of *P. flexilis* are, as Dr. James already stated and as Dr. Hayden confirmed, eaten by the Indians. They are distinguished from those of any others of our Pines by a persistent, sharp, keeled margin, representing the wing."

In Forest Trees of the Pacific Slope, by George B. Sudworth, issued in 1908 as a publication of the Forest Service, are found the following remarks, pages 27 to 30:

"Young trees are peculiar for their regular, distant whorls of short, very tough branches which stand at right angles to the trunk and extend down to the ground. Middle-aged and old trees (75 to 200 years) are characterized by extremely long and slender branches, especially near the ground and at the top; the latter are often 16 or 18 feet in length, falling gracefully at a sharp angle with the trunk. These branches appear to develop entirely at the expense of the trunk, which remains stunted. Old trunks have bark from 1 ½ to nearly 2 inches thick, black-

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ish or very dark brown, with deep furrows between wide rectangular blocks. On trunks from 8 to 12 inches thick the bark is broken into small, thin, gray-brown plates; when separated, the scales expose a dull reddish inner bark. The thin, smooth bark of young pole trees and of branches is a bright whitish gray, often silvery. The foliage, densely set at the ends of the branches, is dark yellow-green, and the needles are 5 in a cluster. Cones mature in late summer or early autumn of the second year, shed their seed in September and early in October. They are from 3½ to 10 inches long and peculiar in having their light yellowish-brown scale tips greatly thickened; inner portions of the scales, pale red. By early winter the cones have fallen from the trees. The seeds are deep reddish brown speckeled with blackish brown. Wood very dense on account of its exceedingly slow growth; light, soft; pale lemon-yellow."

"On slopes of the Cordilleran Plateau from the eastern side of the Continental Divide, in Alberta and Montana, southward to New Mexico, Arizona, Nevada, and southern California."

Then follows a list of stations where it has been found in California, ranging from as far north as Mono Pass east of the Yosemite, south to the San Jacinto mountains in Riverside county, with a westerly extension to Mt. Pinos in the Tehachapi range. The following are notes concerning its occurrence, climatic conditions, tolerance and reproduction:

"On dry, rocky, east slopes, summits, tops of ridges and foothills, and sometimes on sides of moister canyons and banks of mountain streams. Adapted to a great variety of soils and not exacting as regards depth or moisture, but grows best in moist, well drained soils. Usually in dry, rocky, very shallow soil, appearing to prefer dry, loose, gravelly loam, with little or no humus. Reaches higher elevations on clay soils than on sandy ones.

"Usually occurs singly or in small groves among other conifers, where it is of largest size; occasionally in pure, open stands, commonly stunted, on exposed slopes and ridges. Apparently less frequent in Pacific than in Rocky Mountain range. Associated mainly with lodgepole pine and black hemlock at

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higher elevations, and sparingly with white fir and stunted sugar pine at lower altitudes.

"Endures a variety of climatic conditions throughout range. Mean annual rainfall varies from 15 to 30 inches. Snowfall heavy, except in southern Rockies and southern California. Growing season, from 3 to 4 months in north; somewhat longer in south. Minimum temperature from about –60° F. in north to –13° F. in south; maximum temperature throughout range, from 90° to 97° F. Little atmospheric moisture.

"Appears to require full light. Never forms a dense stand, and does not tend to crowd out other species; only occasionally in fairly dense mixed stands. Similar in light requirements to white-bark and bristlecone pines, and less tolerant than other associated conifers.

"Moderate seeder, varying with region and elevation. Generally bears cones abundantly in open stands at low altitudes, less abundantly in denser stands at higher elevations. Cones produced locally about every year. Seeds practically wingless and shed only near tree; largely eaten by birds and squirrels. Mineral seed-bed most favorable for germination, which even under favorable conditions is but moderate."

Watson, Bot. King Rep. 332, says it is "the prevalent pine in the East Humboldt [Ruby] Mountains, Nevada, and frequent in the Wahsatch and Uintas; 6,500 to 11,000 feet altitude. The aged trees of the East Humboldt Mountains, often 250 to 500 years old and 2 to 3 feet in diameter, rarely 50 feet high, are too knotty and cross-grained to be valuable for timber."

Coville, Cont. U. S. Nat. Herb. 4: 221, records it from southern Nevada: "This, the Rocky Mountain white pine, was found on the Charleston Mountains (No. 316), growing with *P. aristata*, but not so abundant as that species."

Although this pine no doubt occurs on other high ranges in Nevada, I find no other recorded stations for it in the literature at hand.

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DECEMBER, 1910

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MUHLENBERGIA

NOTES UPON SOME ANNUAL LUPINES OF THE MICRANTHUS GROUP

By C. P. Smith

During four years of residence in western middle California, perhaps no genus of plants appealed to me as much as did the lupines, and the more I observed them and referred to the available literature, the more I was dissatisfied with my earlier determinations and the usual recognition of specific limits. Hence during my fourth and last season there, practically all of the time and energy I could spare for botanical study was concentrated upon these plants, and of these the small annuals of the Micranthus group received the most intensive study.

While most of my observations were made about Stanford University, one trip was made into Sonoma county, and two trips were taken to Oceanview, Colma, and South San Francisco. Material was secured also at Pacific Grove and in Hall's Valley, thru which passes the Mt. Hamilton stage road from San Jose. Thus it is apparent that only a beginning was made in the study of the forms under consideration; but since there is no probability that I will, in the near future, be able to continue the study in the field, I have thot it best to offer certain of my conclusions and drawings now, hoping that the same may be of interest to other observers of these plants. The drawings were made from hand from fresh material, except as noted below, being drawn to about the same scale and with regard to a careful comparison of detail, in each case average blossoms being selected from abundance of material. The side and front views of the blossoms were drawn first, then the lower and upper calyx lips, each as seen in situ in the undissected flower. In the case

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of figures 1 and 4, however, an additional drawing of the lower calyx lip was added from detached material, flattened out under a cover-glass, to show the small interstitial bractlets not in evidence until the flower is dissected; and also in figure 4, the tridentate tendency of the apex, another character not evident unless the sharply keeled lip is flattened out.

I will now proceed to define what I here accept as the Micranthus group. As to the North American annuals of the subgenus Lupinus, I recognize three groups, indicated by the following key:

Flowers scattered	*Concinni*
Flowers verticillate	
Plants large, succulent, puberulent	*Affines*
Plants small, more fibrous, villous	*Micranthi*

In the Micranthi as thus designated, I accept: *L. nanus* Dougl., *L. vallicola* Heller, *L. pachylobus* Greene, *L. bicolor* Lindl., *L.* sp., *L. trifidus* Torr., *L. rostratus* Eastw., *L. umbellatus* Greene, *L. micranthus* Dougl., and *L. polycarpus* Greene. Of these I have collected but six, so can say nothing, from my own field experience, of *pachylobus*, *micranthus*, *rostratus*, and *umbellatus*. *L. pachylobus* belongs to the "San Francisco Bay region," but was not found by me; *L. umbellatus* is found in southern California (1), and on one, at least, of her islands (2); *L. rostratus*, from San Luis Obispo county, apparently has not been recorded since described; and *L. micranthus* will probably some day be acknowledged as not found in middle western California, unless represented by what is now known as *L. polycarpus*.

LUPINUS NANUS Dougl.; Benth. Trans. Hort. Soc. II. **1**: 409. 1835.

Easily determined and probably not often incorrectly placed. I have not illustrated this species, but will say that the side view of the banner is much as in *L. vallicola*, but the sides often fold backward to such an extent that the front view gives more the effect portrayed for *L. bicolor*. My collections are as follows:

(1) Specimens collected by Abrams, determined by Greene.
(2) Greene, Bull. Cal. Acad. **2**: 145. 1886.

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Mayfield, Santa Clara county, 8 April, 1905, *793;* Pacific Grove, Monterey county, 16 May, 1906, *1170;* Petaluma, Sonoma county, 1 April, 1908, *1384;* Mayfield, Santa Clara county, 8 April, 1908, *1394;* South San Francisco, San Mateo county, 26 April, 1908, *1411;* same as last, another location, *1413.*

LUPINUS VALLICOLA Heller, Muhlenbergia **4:** 40. 1908.

Lupinus persistens Heller, Muhlenbergia **2:** 62. 1905.

I have one collection that may be referred here, my no. *1280,* from near Colfax, Placer county, 4 May, 1907. Otherwise I have had no experience with typical *vallicola;* but I now have before me Mr. Heller's specimen of the type collection, his no. *7850.*

LUPINUS VALLICOLA **apricus** (Greene)

Lupinus apricus Greene, Leaflets **2:** 67. 1910 (**3**).

So recently described as a new species, and at my request, it is with much regret that I must now reduce this form to varietal rank. Believing it to be an undescribed form, I recently asked Dr. Greene to describe it, since Baker's specimens, bearing Greene's name, have for some time been in the principal herbaria. I recognized, however, that *vallicola* was certainly close, and accordingly suggested to Dr. Greene my suspicion of the affinity of the two forms; but, after the description of *apricus* appeared, I accepted the matter as settled; hence was much surprised when, a few days later, I learned that Dr. Greene had informed Mr. Heller that *apricus* and *vallicola* are the same species. I have accordingly completely reviewed the matter, and now wish to claim for the variety the following:

Differs from the species in the seeds being well marked with a prominent dark brown line on each side (as in so many of the Californian lupines) and the rest of the surface thickly marbled or finely dotted with dark grayish-brown.

(**3**) The cover illustration is from a co-type of *L. apricus* in the herbarium of A. A. Heller, collected on foothills near Stanford University, Santa Clara county, California, April 15, 1902, *C. F. Baker 610.*—A. A. HELLER.

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Comparing the original descriptions, one finds "keel naked," and "pod . . 6-seeded" among the characters ascribed to *apricus*, while *vallicola* is described as having the keel "bearded on the upper half," and the "pods . . 3-5-seeded." A careful study of the material at hand shows that the keel is bearded above on the apical half in both forms, and also the pods vary from 3-7-seeded in either case. Hence other characters must be sought if the two are distinguishable. I do find the seeds with Mr. Heller's specimen "pale, unmarked," excepting that there is a suggestion of the usual lateral line on each side—a darker flesh-colored line relieved by the paler yellowish ground. Otherwise I see no characters present that I feel may be relied upon to distinguish *apricus* from *vallicola*. I have, in truth, collected no seed of *vallicola* myself, my one collection being in flower only; but I have collected, and have before me now, ripened seeds from the several stations from which came my *apricus* numbers *725*, *1374*, *1395*, *1426*, *1427* and *1485*, and believe that the seed characters pointed out above justify the recognition of *apricus* as a namable form.

Typical *vallicola* belongs to the Sacramento valley and probably also well southward into the San Joaquin valley; while the variety is at its best on the west side of the Santa Clara valley in Santa Clara and San Mateo counties, just at the edge of the fog line of the humid coast belt.

A common and conspicuous form about Stanford University, the latter was the first member of the Micranthus group to come under my notice. Using Jepson's Flora, I called it *L. micranthus bicolor*, and soon found that that was the name by which it was generally known at Stanford. Jepson undoubtedly followed Watson (**4**) in thus disposing of Lindley's *L. bicolor*, and both of these authors have evidently interpreted *vallicola* to be the plant described by Lindley; but if either of these men compared the plant in question with the plate illustrating *L. bicolor*, I can not see how such a decision could have been made. Direct evidence that Watson's *L. micranthus* var *bicolor* is Hel-

(**4**) Brewer and Watson, Bot. Cal. **1**: 123.

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ler's *vallicola* may be found in a note at the end of his treatment of said species (4), which note reads: "The var. *bicolor* approaches forms of *L. nanus*, and tends to unite the two species." Now var. *apricus* is certainly nearer to *nanus* than is any other member of the Micranthus group.

Of course variations occur, but while I noted decided variations in the size of the flower, and of the plant as a whole, due to apparent soil, moisture, or light relations, the shape of the floral parts were satisfactorily constant and distinctive. Hence, as soon as I had satisfied myself concerning the status of each of the forms mentioned below, I accepted it as distinct, and used Greene's unpublished name for it.

My numbers *599*, *725*, *1374*, *1395*, *1404*, *1426*, and *1427* are all *L. vallicola apricus* from about Stanford University, collected in April and May, 1905 and 1908. Numbers *1297a* and *1485* are from Hall's valley, Mt. Hamilton range, 1600 and 1750 feet elevation, and collected 10 May, 1907, and 17 June, 1908, respectively.

LUPINUS BICOLOR Lindl. Bot. Reg. **13**: *pl. 1109*. 1827.

Mr. Heller's notes in Muhlenbergia **2**: 292, led me to look for this plant where noted by him. I found it abundant along the railroad near Ocean View, and back of the cemeteries, southeast of Colma. Sheet *82225*, University of California herbarium from San Francisco is this species, and is so labeled, determined by E. L. Greene, C. F. Baker, collector. I have compared my specimens with the original description and plate, and accept the above determinations. My numbers *1418* and *1422* are from "back of Cemeteries," San Mateo county, 26 April, 1908.

LUPINUS TRIFIDUS Torr.; Wats. Proc. Am. Acad. **12**: 250. 1877.

A species not apt to be confused with any of its relatives. It is also variable in size; at Pacific Grove the flowers as well as the seeds averaging much smaller than in the San Francisco specimens. It was found growing with *L. bicolor* near San Francisco, the two forms commonly sharing the same ground, with their branches intermixed. As a rule, a mere glance was

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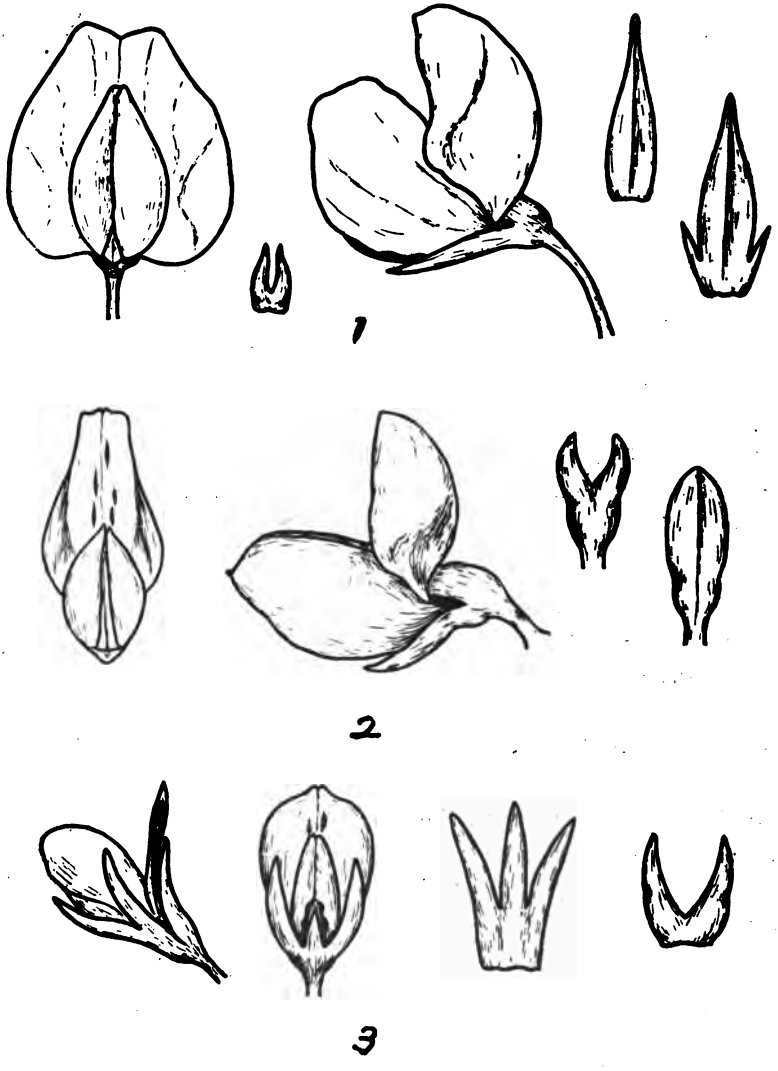
Plate 6



1. Lupinus vallicola apricus. 2. Lupinus bicolor. 3. Lupinus trifidus.

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sufficient to determine any plant; but an occasional plant of *L. bicolor* was found with the lower calyx lip three-toothed and the whole plant more hirsute, so that I was tempted to wonder if such specimens could be actual hybrids of the two species. I have now abandoned such thought.

Pacific Grove, Monterey county, 24 June, 1906, *1194*, 23 June, 1907, *1358;* Cemeteries, San Mateo county, 26 April, 1908, *1419*, *1423*.

Figure 20. Upper row: Lupinus sp. Lower row: Lupinus polycarpus.

LUPINUS sp. (Figure 20, upper row.)

A very interesting species was found in a grain field along the San Francisquito creek, near Stanford University, associated with *L. vallicola apricus*, which greatly predominated. It occurred in two notable color variations—pure patches each of blue and pink flowered plants being scattered here and there within the limited area occupied by the species. As to the mere difference in color, the explanation seems easy. The normal blossom is bright blue wtih definite purple areas. In the pink or semi-albino flower the blue is entirely absent and the lavender-pink spots correspond exactly with the purple (or violet) spots of the normally pigmented blossom, white taking the

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place of the blue. Why the blue pigment was absent in the partially albino flowers while the lavender-pink pigment was present, is, of course, another question, and one that I did not investigate. However, I tagged and gathered seed from several plants of each color type and later planted the seeds, hoping to find out whether the pigment characters would breed true; but disappointment awaited me, as none of the seeds germinated, even tho three different plantings were made.

The seeds are pale flesh-colored, almost unmarked in the case of the pink flowered plants, but plainly marked with a marbling of yellowish-brown in the normal colored plants—by far the palest colored lupine seeds I have collected in California. My numbers *1402* and *1403* are of the pink and blue flowered forms respectively, collected 13 April, 1908, Stanford University estate, San Mateo county side of the stream mentioned above.

This species is evidently one of the forms that commonly pass as *L. micranthus* in California; but such a determination can not hold, as proved to me by a careful study of a recent collection, Mr. Heller's no. 10100, from along the Columbia, in Oregon, probably very close to where Douglas secured his *L. micranthus*. I have very recently compared a specimen of that collection with the original description and plate of *L. micranthus* (Lindl. Bot. Reg. **15**: *pl. 1251.* 1829) and my conviction is firm that Mr. Heller has secured the true *micranthus*, and that few or none of the plants from middle and southern California called *L. micranthus* are properly so determined. The nearest affinity of true *micranthus*, and it seems to me a close one, is with Greene's *L. polycarpus*, as I have already suggested in the early part of this paper.

I have found no description of an annual that will apply to my nos. *1402* and *1403*, hence believe that it is really undescribed, having been accepted as *L. micranthus* for years; but the limited distribution of my plant in a cultivated field, the color of the seeds, and also the fact that the species was found nowhere else in my wanderings, all suggest to me that it may have been introduced from elsewhere, probably from the great interior valley, or from southern California, where, as I learn

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from Professor Abrams, the plant considered to be *L. micranthus* has pale colored seeds, and is similar to my plant in other respects. Under the circumstances, I do not care to offer a name for my collection at the present time.

LUPINUS POLYCARPUS Greene, Pittonia **1**: 171. 1888.

This robust plant with "short narrow close racemes of small flowers and many large pods," as characterized by Jepson, is certainly a well-marked form, at least as compared with its relatives of middle western California. It is anything but conspicuous when in bloom, especially if growing amid grass, while *L. vallicola apricus* is almost, if not quite, as showy as *L. nanus*. *Polycarpus* in fruit, however, is as noticable as any, if not the most conspicuous of them all. About Stanford University, at least, it seems to prefer adobe soil, while *L. vallicola apricus* grows in sandy loam.

The following are my collections of *L. polycarpus*. I noted it also at Santa Rosa, Guerneville, and Sebastapol, Sonoma county:

Hall's valley, Mt. Hamilton range, 10 May, 1907, *1297;* Mayfield, Santa Clara county, 22 March, 1908, *1367*, 13 April, 1908, *1396;* Petaluma, Sonoma county, 1 April, 1908, *1379*, *1385;* Stanford University, Santa Clara county, 22 April, 1908, *1409*.

In conclusion, I would thank Professors Dudley and Abrams for many courtesies extended to me in connection with the herbarium and library of their department at Stanford University. Many helpful suggestions were also freely given me by them, altho the work was not done under their direction. To Dr. Hall I am duly grateful for the privilege of examining the lupine series in the herbarium of the University of California. To Mr. Heller I also extend my thanks for the use of specimens of his numbers *7850* and *10100*.

Utah Agricultural College, Logan, Utah.

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A NEW STUDY OF CARDUUS

By George E. Osterhout

In the Rocky mountains *Carduus* is a large and difficult genus. It is well represented from the plains to the alpine regions. In his Flora of Colorado Dr. Rydberg lists thirty-two species, while the the Illustrated Flora of Britton and Brown lists only sixteen species for the northeastern United States and Canada. Anything like a full list of the forms found in Colorado has never been made, and forms resembling some of the known species in some characters, but differing in others, have made the study difficult and discouraging. This is especially true of the mountain species. Several forms have been collected which in a general way have a strong resemblance to *C. Americanus* (Gray) Greene, and yet are far from being .ypical. In the higher mountains forms resembling *C. Parryi* (Gray) Greene, and *C. scopulorum* Greene, have been collected. These forms were puzzling to the student, for it did not seem possible to make as many species as there are forms, and it did not seem to be a satisfactory disposition of them to place them with species which were regarded as typical.

The first real helpful solution of this difficult problem was suggested by Dr. Rydberg in the Bulletin of the Torrey Botanical Club for November, 1910. He regards these perplexing forms as hybrids, and lists fourteen as occurring in Colorado, with five others in contiguous territory. In this list *C. americanus* is one of the supposed parents of four forms, *C. acaulescens* of three, and *C. griseus* of three. Various other species make up the other supposed parents and the other hybrids.

It may be that some of the forms which Dr. Rydberg considers hybrids will prove to be independent species, and there may be other hybrids as yet unnoticed. However, Dr. Rydberg has begun a new line of study which ought to induce more careful observation, and bring a better collection of Carduui. These plants have not been attractive to collectors, probably because they are disagreeable to handle, and are cumbrous specimens. There is ueed of much more collecting and study before the genus can be satisfactorily worked out for the Colorado flora.

New Windsor, Colorado.

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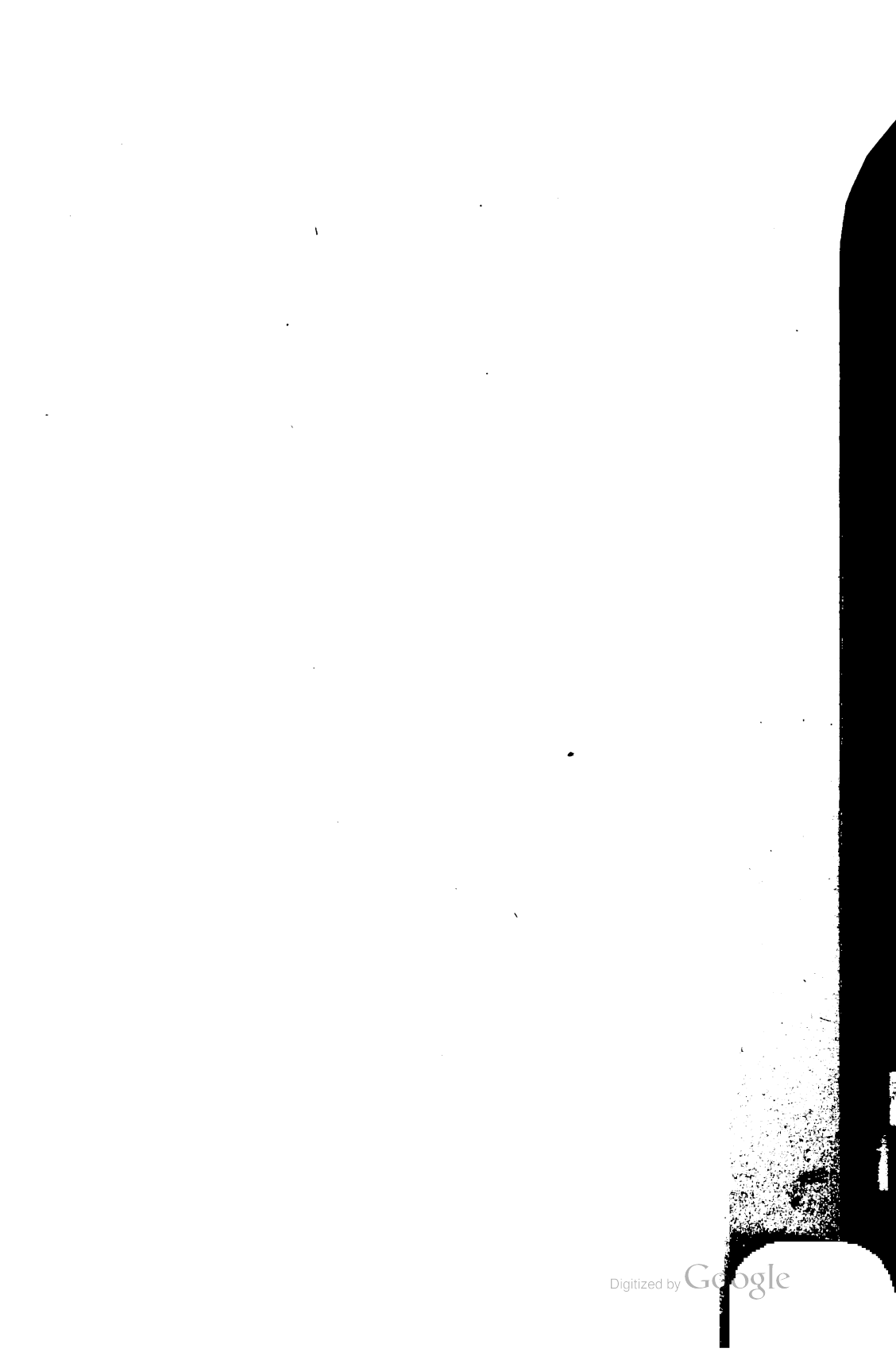
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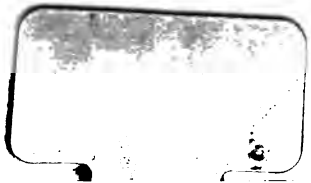

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